Making Thermal Remediation More Sustainable: A Detailed Analysis

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THIRD INTERNATIONAL SYMPOSIUM ON BIOREMEDIATION AND SUSTAINABLE ENVIRONMENTAL TECHNOLOGIES

FINAL PROGRAM

MAY 18-21, 2015 | MIAMI, FLORIDA

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Battelle gratefully acknowledges the support of the following organizations, which have made financial contributions toward the general costs of planning and conducting the Symposium. The corporate descriptions they provided appear on pages 36 and 37.

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THIRD INTERNATIONAL SYMPOSIUM ON BIOREMEDIATION AND SUSTAINABLE ENVIRONMENTAL TECHNOLOGIES

Welcome to Miami! Thank you for attending the 2015 Bioremediation Symposium. We're looking forward to a great week, with about 800 environmental professionals from 25 countries participating in the extensive technical program and other events.

The program will present information on advances in bioremediation and the incorporation of green and sustainable practices in remediation. Technologies and implementation practices will be examined in a series of technology-focused sessions. The development and use of advanced tools for assessing and monitoring bioremediation and natural attenuation, as well as the challenges of applying bioremediation at various types of complex sites and under extreme climatic conditions, will be considered. Several sessions will address biodegradation of emerging contaminants and biofuels and the evaluation and mitigation of vapor intrusion.

A series of sessions will cover biodegradation and remediation of crude oil in various environments and the management of petroleum hydrocarbon sites. The role of biological processes in unconventional oil and natural gas production will be considered, reflecting the continuing challenges of treating produced water and managing downhole fouling.

Green and sustainable remediation (GSR) practices will be discussed as they apply to all stages of remediation, from remedy selection and optimization to long-term monitoring and management strategies. Sessions will address the adaptation of remediation systems to climate change, international perspectives on GSR, and the factors that affect the implementation of bioremediation in various regions of the world.

Short courses will be offered on Monday. The Symposium Registration Desk will open at 2:00 p.m. Monday. The 56 exhibit booths, the Welcome Reception, and the first poster display will open at 5:00 p.m.

The Plenary Session will begin at 6:30 p.m. Monday. The featured presentation, "Environmental Management in a Changing World: Lessons from South Florida," will be given by Leonard Berry, Ph.D., of the Florida Atlantic University. Dr. Berry will discuss the current and future impacts of sea-level changes on the people and environment of the South Florida region, as well as ongoing efforts to respond to the changes.

Sixty-one breakout sessions and three panels will be conducted Tuesday through Thursday. Posters will be presented in two groups, on Tuesday and Wednesday evenings. More than 500 platform and poster presentations are scheduled.

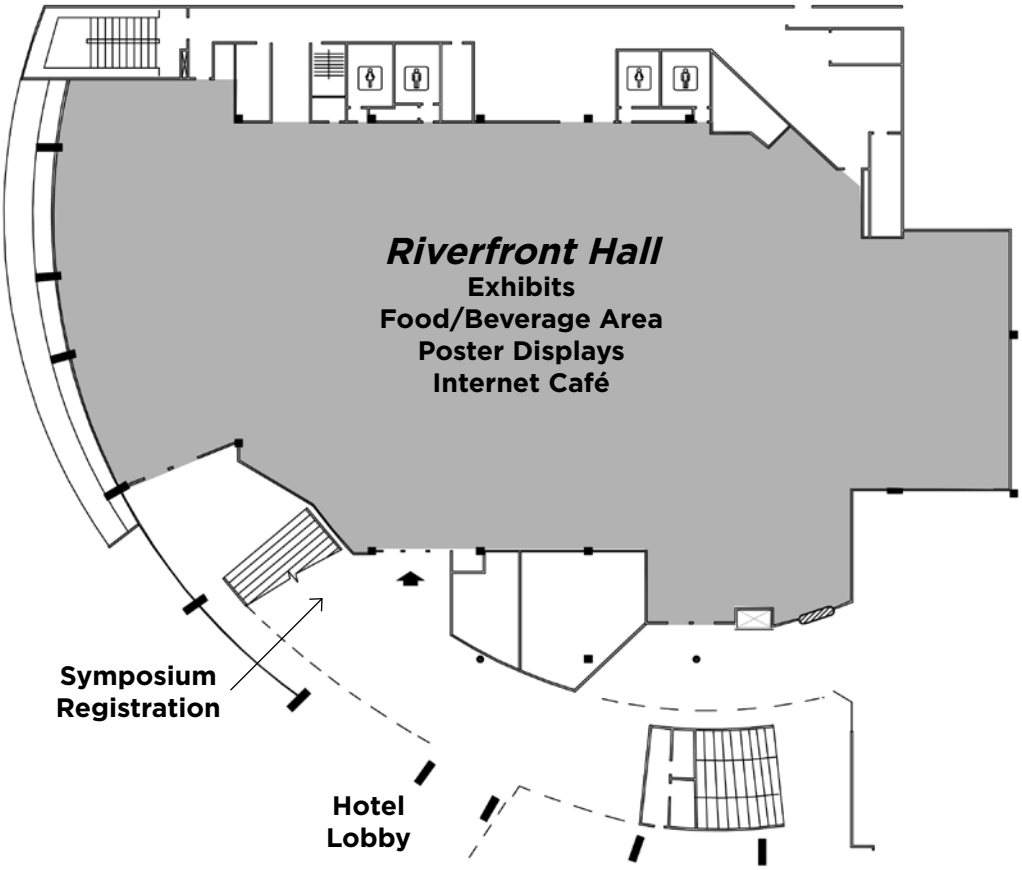
We appreciate the participation of the Symposium Sponsors, whose financial support has been an important part of the planning process. In addition, we recognize the efforts of the Technical Steering Committee, the session chairs and panel organizers, and the presenters who have devoted their time and technical expertise to developing a high-quality program.

Ramona Darlington
Andrew C. Barton
Symposium Chairs (Battelle)

Contents

SYMPOSIUM FLOOR PLAN

LOBBY LEVEL



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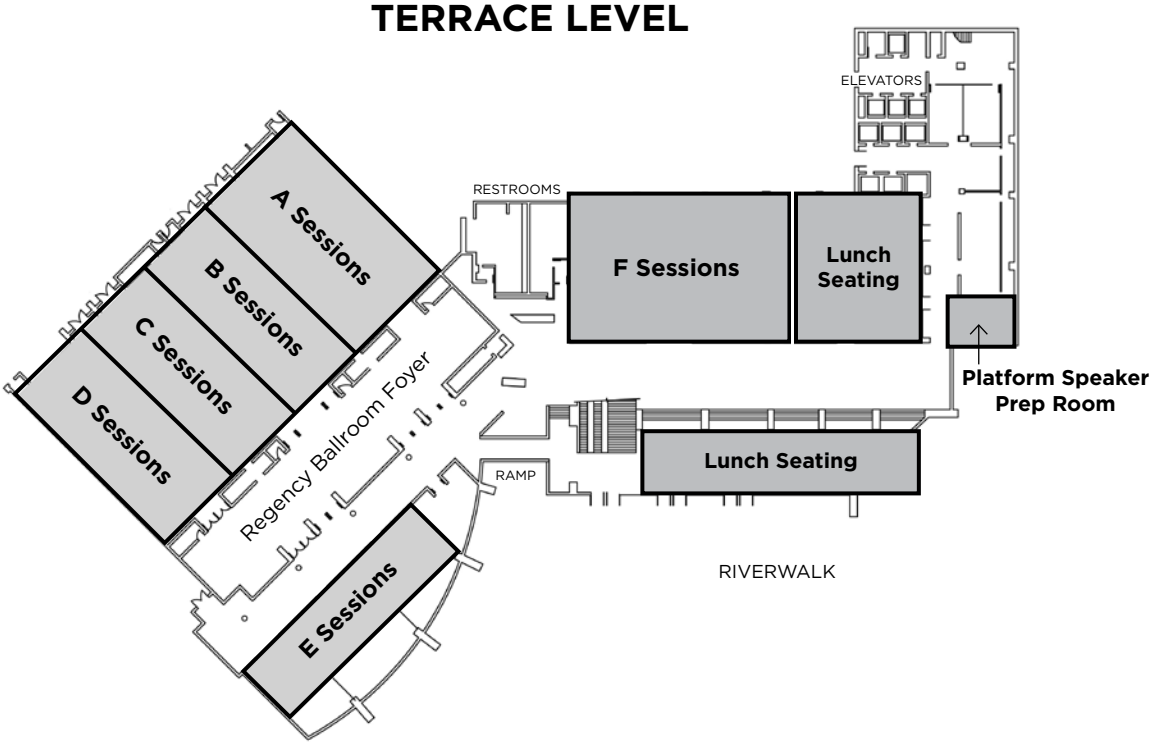
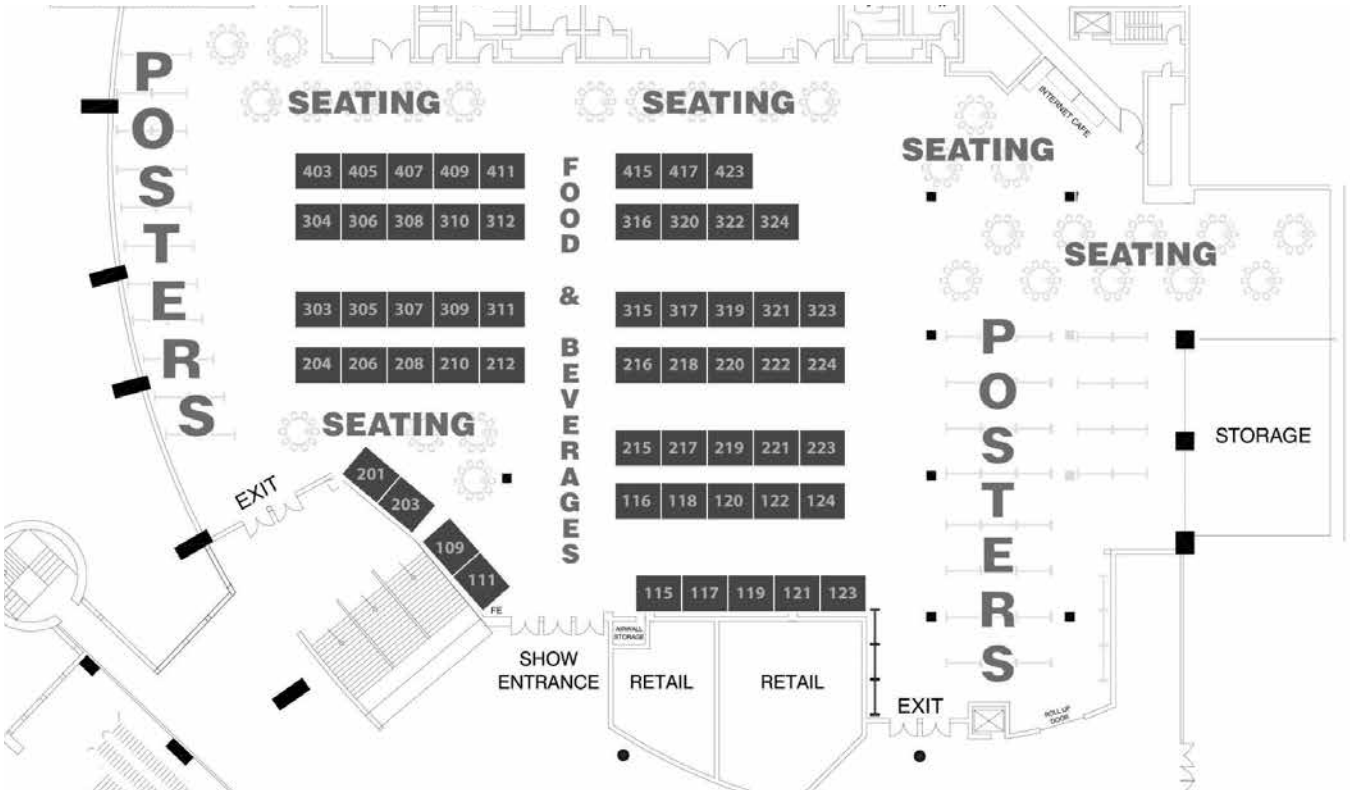


EXHIBITORS AND EXHIBIT FLOOR PLAN



Listed by Organization—Symposium Sponsors Shown in Bold

GENERAL INFORMATION

All Symposium events will be held at the Hyatt Regency Miami. Floor plans appear on page 2. See the pages noted below for additional information about each event.

Schedule Overview

Monday, May 18

- 8:00 a.m.–5:00 p.m. Short Courses
- 2:00–8:00 p.m. Registration Desk Open
- 5:00–6:30 p.m. Exhibits, Welcome Reception, Group 1 Poster Display
- 6:30–8:00 p.m. Plenary Session

Tuesday–Thursday, May 19-21

The technical program will be conducted Tuesday morning through Thursday afternoon. The 61 sessions and three panels are organized into thematic tracks as shown in the column to the right. See pages 8–9 for the platform sessions and panels to be conducted each day and pages 15 and 25 for the poster sessions on Tuesday and Wednesday evenings.

Presentations

Platform and poster presentations and panels scheduled as of April 28, 2015, are listed by day on pages 10–33. Late revisions in platform presentations (speaker changes, withdrawals) will be marked on overview sheets posted in the registration area and on daily lists outside each breakout room.

Platform talks are scheduled at 25-minute intervals, and each talk is to begin promptly at the time printed in the schedule, except as may be noted at the beginning of the day on the overview sheets and the daily lists. Session chairs are to adhere strictly to the schedule, making it possible for registrants to move between breakout rooms to hear the talks of greatest interest to them. To minimize distraction, please confine such movement to the short intervals between talks.

Panel discussions are scheduled within the platform session tracks.

Posters will be displayed in the Exhibit Hall and will be presented on Tuesday and Wednesday evenings. During the presentation periods, presenters will be at their posters to discuss their work, and refreshments will be served. See pages 14–19 and 24–29 for details on the poster presentations.

Please do not take photos or videos of any platform, panel, or poster presentation without securing the speaker's permission and notifying the session chair in advance.

Program Topics

Bioremediation Technologies: *Sessions A1–A10*

Evaluating and Mitigating Vapor Intrusion: *Sessions B1–B4*

Munitions Response: *Sessions B5–B6*

Biodegradation of Emerging Contaminants: *Sessions B7–B11*

Managing Petroleum Hydrocarbon Sites: *Sessions C1–C6; Panel on Tuesday*

Biodegradation and Remediation of Crude Oil in Different Environments: *Sessions C7–C9*

Biological Processes in Unconventional Oil and Natural Gas Development: *Session C10*

Advances in Natural Attenuation: *Sessions D1–D3*

Advanced Tools for Assessing Bioremediation: *Sessions D4–D9; Panel on Wednesday*

Sustainable Site Management Strategies: *Sessions E1–E3*

Green and Sustainable Remediation (GSR): *Sessions E4–E7; Panel on Tuesday*

Bioremediation in International Settings: *Sessions E8–E10*

Bioremediation Implementation Practices: *Sessions F1–F5*

Application of Bioremediation to Complex Sites: *Sessions F6–F11*

Professional Development: Documentation of Attendance

If you would like to receive a certificate of Symposium attendance, inquire at the Registration Desk. Certificates will be emailed after the Symposium.

If your state licensing board accepts conference attendence and will require documentation of hours attended during the Tuesday through Thursday technical program, a daily attendance log can be established for you. You will need to sign in and out whenever you arrive at or leave the Symposium.

Exhibits

The 56 exhibitors are companies, government agencies, and not-for-profit organizations that provide environmental assessment, remediation, and management services and products. Exhibits will be on display from 5:00 p.m. Monday through 1:00 p.m. Thursday. The Exhibit Hall will close at 6:30 p.m. on Monday evening for the Plenary Session. See page 3 for the floor plan and the list of exhibitors. Daily continental breakfasts, breaks, lunches and receptions will be served and seating will be provided in the Exhibit Hall.

Internet Café/Charging Stations/ Meeting Space

Internet Café kiosks and charging stations will be available to participants who wish to check email during Symposium hours Tuesday–Thursday. The kiosks and charging stations will be in the Exhibit Hall; please be considerate and limit your use of these areas when others are waiting. Complimentary wireless Internet access also is available in the Hotel lobby. Private meeting rooms may be available for attendees' use; check at the Symposium Registration Desk for details.

Internet Café Sponsor

We appreciate the participation of CB&I, whose contribution has been applied toward the cost of the Internet Café.

Proceedings

All presentations given at the Symposium will be represented in the proceedings. Each platform and poster presenter was invited to submit a short paper expanding upon his or her presentation. If no paper was submitted, the one-page abstract used in the abstract collection distributed shortly before the Symposium will be included in the proceedings, along with the slide files for platform presentations. After the Symposium, the proceedings will be compiled, indexed, and published in electronic format. The link to the proceedings will be distributed to technical-program registrants by July 31.

Messages/Job Board

A message board will be available near the Symposium Registration Desk for the use of attendees wishing to contact one another. This board will be used also for messages taken by the registration staff for attendees. Notices about jobs available or help wanted may be posted here.

Meals and Receptions

For the convenience of Symposium attendees, meals and beverage breaks will be provided on site during the program at no additional cost to program registrants and exhibit booth staff. Light receptions will be served on Monday evening and during the Tuesday and Wednesday evening poster sessions. Continental breakfasts, morning and afternoon beverage breaks, and lunches will be provided Tuesday through Thursday. For other meals, several options are available in the hotel, and many restaurants and cafés are within walking distance from the hotel. Registrants may purchase guest meal tickets at the Symposium Registration Desk; guest tickets will be priced equal to the cost incurred by the Symposium for each meal.

Food and Beverage Sponsor

We appreciate the participation of Changyuan Chemical, whose contribution has been applied toward the overall cost of food and beverage.

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GENERAL INFORMATION

Student Participation

In addition to the technical information gained by attending presentations and visiting exhibits, students will be able to meet and talk with environmental professionals representing a wide range of work experience and employers.

Student Paper Competition. Papers were due November 15, 2014. The review committee was led by Kate Kucharzyk, Ph.D. (Battelle). The winners received a complimentary Symposium registration and, through the generosity of the Student Event sponsors, a financial award to help cover travel and related costs.

Student Paper Winners

Jolanta Niedzwiecka (Clemson University)
Title: Microbially Mediated 2,4-Dinitroanisole (DNAN) Degradation by Reduced Electron Shuttles
Presentation: Poster #42, Group 1 (Tuesday)

Fernanda Paes (Michigan State University)
Title: Novel Genera Identified as Vinyl Chloride-Assimilating Microorganisms Using Stable Isotope Probing
Presentation: Poster #52, Group 2 (Wednesday)

Daniel Vredenburg (University of Michigan)
SURF Student Paper Winner
Title: Use of Constructed Wetlands to Remediate LNAPL-Contaminated Groundwater on Former Industrial Property
Presentation: Poster #101, Group 1 (Tuesday)

Congratulations!

Student Mixer. To increase networking opportunities and help students become acquainted, a Student Mixer will be held on Tuesday evening, following the poster presentations. The Mixer will be attended by invited mentors who are environmental professionals selected from a variety of public- and private-sector organizations.

Student Event Sponsors. The following organizations provided financial support for the student paper awards and the Mixer.

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PLENARY SESSION

Plenary Session

Monday, May 18, 6:30-8:00 p.m.

Welcome and Opening Remarks
Symposium Chairs:
Ramona Darlington, Ph.D. (Battelle)
Andrew C. Barton (Battelle)

Presentation of Student Paper Awards
Kate Kucharzyk, Ph.D. (Battelle)

Environmental Management in a Changing World: Lessons from South Florida
Leonard Berry, Ph.D. (Florida Atlantic University)

Featured Speaker

Environmental Management in a Changing World: Lessons from South Florida

Leonard Berry, Ph.D.
Florida Atlantic University

Water is a highly managed commodity in South Florida, and sea-level changes already are impacting both the management system and the people who live in it. Currently, projected changes of sea level are part of the planning and development process for some but totally ignored by others.

Dr. Leonard Berry's address will outline current and future challenges to the people and environment of the region and explore the dilemma of increased energy use and pollution in many of the adaptation measures. He will describe the ongoing responses—re-engineering infrastructure, forming partnerships between counties and municipalities, and rethinking planning processes. Lessons from ground zero in South Florida can provide opportunities for others in terms of sustainability planning and bioremediation processes.

Dr. Berry has worked on climate change issues globally for more than 40 years. Early in his career, he worked on environmental research and development training programs for the U.S. Agency for International Development (USAID), the World Bank, and several agencies of the United Nations. He is a lead author of Chapter 17, "Southeast and the Caribbean," of the National Climate Assessment. He is the founder and immediate past Director (1994-2014) of the Florida Center for Environmental Studies, Emeritus Professor of Geosciences at Florida Atlantic University (FAU), and the Director of the Climate Change Initiative at FAU. In addition, he participates in several regional, national, and international working groups on water and climate. He testified in April 2012 before the U.S. Senate Committee on Energy and Natural Resources on the impacts of sea level rise in Florida. In December 2014, Dr. Berry was presented the FAU President's Distinguished Service Medallion for his work in understanding climate change.

Dr. Berry is an Executive Committee member of the Florida Climate Institute, a multidisciplinary network of seven public and private universities working with the public and private sectors to develop a better understanding of climate variability and change, the impacts, and societal response.

MONDAY, MAY 18, 2015

7:00-8:00 a.m. Morning Short Course Check-In
12:00-1:00 p.m. Afternoon Short Course Check-In
2:00-8:00 p.m. Symposium Registration

TUESDAY, MAY 19, 2015

7:00 a.m.-7:00 p.m. Registration, Exhibits, Poster Group 1 Display
7:00-8:00 a.m. Continental Breakfast
Lunch scheduled within each track

8:00 a.m.-5:00 p.m. Short Courses

Short Courses

8:00 a.m.-5:00 p.m.

- State-of-the-Art Approach for Evaluating Monitored Natural Attenuation (Biological and Abiotic), Biostimulation and Bioaugmentation

8:00 a.m.-12:00 p.m.

- Evaluation of Bioremediation and Biodegradation of Chemical Contaminants Using a Variety of Analytical Techniques Including Stable Isotopes

1:00-5:00 p.m.

- Using the NAPL Depletion Model for Estimating Timeframes of Natural and Enhanced Attenuation

Plenary Session

6:30-8:00 p.m.

Welcome and Opening Remarks
Symposium Chairs:
Ramona Darlington, Ph.D. (Battelle)
Andrew C. Barton (Battelle)

Presentation of Student Paper Awards
Kate Kucharzyk, Ph.D. (Battelle)

Environmental Management in a Changing World: Lessons from South Florida
Leonard Berry, Ph.D. (Florida Atlantic University)

8:00 a.m.-5:35 p.m. Platform Sessions

A1. Aerobic and Anaerobic Biodegradation of Organic and Inorganic Contaminants
A2. Advances in Biological Oxidation of Chloroethenes and Other Priority Contaminants
A3. Phytoremediation
A4. Mycoremediation

B1. Chlorinated Compound Vapor Intrusion
B2. Petroleum Hydrocarbon Vapor Intrusion
B3. Innovative Tools for Evaluating Vapor Intrusion Risk
B4. Vapor Intrusion Mitigation Methods

PANEL. TPH—What is the Right Cleanup Level?
C1. Remediation of Hydrocarbon Spills
C2. Advances in Free-Product Recovery
C3. Advances in Oxygenate Remediation

D1. Tools for Assessing MNA
D2. Natural Attenuation Processes
D3. MNA for Achieving Site Goals

E1. Optimizing Existing Systems
E2. Risk Management Strategies
E3. Licensed Site Remediation Professional Programs: Successes and Challenges
PANEL. Do GSR Frameworks Adequately Represent Ecosytem Services and Natural Resources?

F1. Strategies for Bioremediation Performance Assessment
F2. Biobarrier Installation and Management
F3. Amendment Delivery Strategies
F4. Advances in Amendment Formulation

5:00-6:30 p.m. Welcome Reception, Exhibits, Poster Group 1 Display
6:30-8:00 p.m. Plenary Session

5:45-7:00 p.m. Poster Group 1 Presentations and Light Reception
See page 15 for sessions in Poster Group 1.

7:00-8:30 p.m. Student Mixer

WEDNESDAY, MAY 20, 2015

7:00 a.m.-7:00 p.m. Registration, Exhibits, Poster Group 2 Display
7:00-8:00 a.m. Continental Breakfast
Lunch scheduled within each track

8:00 a.m.-5:35 p.m. Platform Sessions

A5. Engineering Biogeochemical Transformation
A6. Microbial Fuel Cells
A7. Combined Remedies for VOCs
A8. Combined Remedies for Other Contaminants

B5. Munitions Response Site Management Strategies
B6. Bioremediation of Munitions Constituents
B7. Emerging Contaminants: Chromium
B8. Emerging Contaminants: Other Metals

C4. Petroleum Hydrocarbon-Related Molecular Diagnostics
C5. Chemical Fingerprinting and Forensics
C6. Aerobic Processes for the Remediation of Petroleum Hydrocarbon Sites
C7. Remediation of Heavy Hydrocarbon-Contaminated Soils

PANEL. Sampling Groundwater Monitoring Wells: Is What's in the Pipe Representative of the Formation?
D4. Fate and Transport of Biofuels
D5. Compound-Specific Isotope Analysis
D6. Molecular Biological Tools

E4. Best Practices in GSR
E5. Incorporating GSR into Remedy
E6. Sustainable Remediation Assessment Tools
E7. International Perspective on GSR

F5. Ex Situ Biological Treatment
F6. Biodegradation in Fractured Bedrock Sites
F7. Biodegradation in Complex Geological Sites
F8. Managing Large and Dilute Plumes

5:45-7:00 p.m. Poster Group 2 Presentations and Light Reception
See page 25 for sessions in Poster Group 2.

THURSDAY, MAY 21, 2015

7:00 a.m.-1:00 p.m. Registration, Exhibits, Poster Group 2 Display
7:00-8:00 a.m. Continental Breakfast
Lunch scheduled within each track

8:00 a.m.-3:30 p.m. Platform Sessions

A9. Successes and Failures of Bioaugmentation and Biostimulation
A10. Cometabolic Bioremediation

B9. Emerging Contaminants: Perfluorinated Compounds
B10. Emerging Contaminants: 1,4–dioxane
B11. Other Emerging Contaminants

C8. Bioremediation in Marshes and Deep-Sea Environments
C9. Biodegradation and Remediation of Crude Oil in Cold Regions
C10. Biological Processes in Unconventional Oil and Natural Gas Development

D7. Advances in Monitoring and Optimization Techniques
D8. Mass Flux and Mass Discharge
D9. High-Resolution Site Characterization

E8. International Challenges and Applications for Site Characterization and Bioremediation
E9. Bioremediation in Latin America
E10. Case Studies and Lessons Learned Applying Bioremediation Internationally

F9. Bioremediation of Deep Contamination
F10. Bioremediation of Sediments
F11. Climate Considerations Associated with Bioremediation

3:30 p.m. Symposium adjourns

TUESDAY MORNING

	A Sessions Tuttle	B Sessions Monroe	C Sessions Flagler
8:00	**A1. Aerobic and Anaerobic Biodegradation of Organic and Inorganic Contaminants** **Chemically Enhanced Microbial Degradation of Recalcitrant Chlorinated Compounds.** *S. Cecillon and T.M. Vogel.* Sebastien Cecillon (Ecole Centrale de Lyon/ France)	**B1. Chlorinated Compound Vapor Intrusion** **Indoor Radon as an Option for Sustainable Ongoing Screening/Monitoring of Short-Term Risks from Low/Episodic Chemical Vapor Intrusion.** *H. Schuver, D. Steck, B. Schumacher, C. Lutes, and R. Truesdale.* Henry Schuver (U.S. EPA/USA)	**Panel** **TPH–What Is The Right Cleanup Level?** **Panel Discussion Tuesday/Track C** ***Moderator*** Sara McMillen (Chevron) ***Panelists*** Deb Edwards (Exxon Mobil) Mala Pattanayek (Integral Consulting) Rob Scofield (GSI Consulting) Fred Vreeman (Alaska Department of Environmental Conservation)
8:25	**Success of Mulch to Treat Chlorinated VOCs in a 170-Day Bench-Scale Study.** *H. Benfield and S. Sadrpour.* Heather E. Benfield (Tetra Tech, Inc./USA)	**Are Industrial Buildings Different? Implication of a Quantitative Vapor Intrusion Analysis of DoD Industrial Buildings Nationwide.** *C.C. Lutes, K. Hallberg, J. Lowe, L. Lund, M. Novak, P. Venable, T. Chaudhry, T. Meyers, I. Rivera, and D. Caldwell.* Christopher C. Lutes (CH2M HILL/USA)	
8:50	**In Situ Congener Study Supports Anaerobic PCB Dechlorination.** *K. Kinsella and S.R. Lamb.* Karen Kinsella (GZA GeoEnvironmental, Inc./ USA)	**In Situ Bioremediation of Chlorinated Solvent Compounds and Implications for Vapor Intrusion Risk.** *P. Scaramella and P. Bennett.* Peter Scaramella (Haley & Aldrich, Inc./USA)	
9:15	**Advanced Field Testing to Support Monitored Natural Attenuation of a Methylene Chloride Groundwater Plume in Bedrock.** *D.A. Marabello, R. Chenenko, S. Mirabello, and T. Macbeth.* David Marabello (CDM Smith, Inc./USA)	**Remediation of Chlorinated Solvents in Groundwater and Soil Gases Using "Green" Pressure-Based Pseudoconvective Transport Processes.** *E.A. Council and C.E. Council.* Edward Augustus Council (Advanced Geologic Sciences, LLC/USA)	
9:40	**Bioremediation via Soil Mixing to Address Chlorinated Ethenes and Ethanes at a Brownfield Site with High Organic and Metal Soils.** *J.F. Good, J. Hayes, L. Zeng, and S. Abrams.* Joseph Good (Langan Engineering & Environmental Services/USA)	**BREAK**	**BREAK**
10:05	**Bioremediation of a Dissolved Ammonia and Nitrate Plume through In Situ Reduction.** *B. Rakewich, D. Nuell, R. Peters, and T. Carlson.* David D. Nuell (Nichols Environmental [Canada] Ltd./Canada)	**B2. Petroleum Hydrocarbon Vapor Intrusion** **Evaluation of Vapor Intrusion Risks of Benzene-Contaminated Sites Using Various Guidance: KMOE, USEPA, ASTM, and Dutch RIVM.** *J.-W. Jung and K. Nam.* Jae-Woong Jung (Seoul National University/ South Korea)	**C1. Remediation of Hydrocarbon Spills** **Comparative Trials of Oil-Sorbent Products for Removing Crude Oil from Water.** *A.M. Lee, S. Okoro and S. Eze.* Curtis C. Stanley (Shell Global Solutions/USA)
10:30	**BREAK**	**Beyond the Guidance: A Summary of ITRC's PVI Guidance Document and How It Was Developed.** *C.E. Regan and M.A. Lahvis.* Catherine Regan (ERM/USA)	**Microbial Biofilms and Bioremediation of Metals from Oil Sands Tailings Ponds.** *S. Golby, R.J. Turner, H. Ceri, and L. Marques.* Susanne Golby (AMEC Environmental & Infrastructure/Canada)
10:55	**A2. Advances in Biological Oxidation** **Engineered Aerobic and Anaerobic Biooxidation at Two Manufactured Gas Plant (MGP) Sites in Florida.** *R.K. Sillan and B. Foster.* Randall K. Sillan (AECOM/USA)	**Vertical Screening Distances for Petroleum Vapor Intrusion Risk Assessment.** *M. Lahvis.* Matthew A. Lahvis (Shell Global Solutions [US] Inc./USA)	**Ozone Enhances the Bioavailability of Residual Heavy Hydrocarbons in Soil.** *T. Chen, B.M. Yavuz, A.J. Proctor, J.M. Ortiz, Y. Zuo, P. Westerhoff, and B.E. Rittmann.* Tengfei Chen (Arizona State University/USA)
11:20	**Assessing the Contribution of Ethene-Oxidizing Bacteria to Aerobic Cometabolism of Vinyl Chloride at Contaminated Sites.** *T.E. Mattes, X. Liu, and Y. Liang.* Timothy E. Mattes (University of Iowa/USA)	**Modeling of Vertical Exclusion Distance Criteria for Assessing the Vapor Intrusion Pathway at Petroleum Hydrocarbon Sites.** *I. Verginelli and R. Baciocchi.* Iason Verginelli (University of Rome Tor Vergata/Italy)	**Biodegradation of Buried MC252 Oil on a Coastal Headland Beach.** *L. Fitch, Z. Romaine, V. Elango, and J.H. Pardue.* John H. Pardue (Louisiana State University/ USA)

D Sessions Brickell	E Sessions Orchid	F Sessions Jasmine	
D1. Tools for Assessing MNA	**E1. Optimizing Existing Systems**	**F1. Strategies for Bioremediation Performance Assessment**	
Lessons Learned from Deployment of CO_2 Efflux Monitoring Methods. *T. Palaia, N. Mahler, and E. Porter.* Tom Palaia (CH2M HILL/USA)	**State of the Practice in Sustainably Optimizing Existing Remediation Systems.** *J.A. Simon.* John A. Simon (Gnarus Advisors/USA)	**Application of Molecular Biology for the Understanding, Engineering, and Modeling of Chlorinated Solvent Bioremediation.** *A. Godain, M.M. David, C. Malandain, O. Sibourg, S. Kaskassian, P.J.J. Alvarez, and T.M. Vogel.* Timothy M. Vogel (Universite de Lyon/France)	**8:00**
Combined Use of Isotope Analysis and Passive CO_2 Flux Traps to Estimate Field Rates of Hydrocarbon Degradation. *J. Zimbron and E. Kasyon.* Julio Zimbron (Colorado State University/USA)	**Transition to Sustainable Biosparging/ Bioventing from Air Sparging/SVE at a Petroleum Hydrocarbon-Impacted Site.** *J. Leu, J. Lin, M. Morales, and S. Ferris.* Jim Leu (Parsons/USA)	**In Situ Microcosms for Evaluation of Sulfate-Enhanced Bioremediation.** *J.H. Archibald, M.M. Martinson, D. Ray, and D.F. Alden.* David F. Alden (Tersus Environmental, LLC/ USA)	**8:25**
Multielement CSIA in the Assessment of Attenuation at a Chlorinated Ethenes Plume: An Application at a Complex Contaminant Plume. *T. Kuder, P. Philp, H.A. Thouement, B.M. van Breukelen, and M. Vanderford.* Tomasz Kuder (University of Oklahoma/USA)	**Using Sustainability Metrics to Improve the Resiliency of an Active Groundwater Remediation System.** *R.L. Nichols, D. Roelant, and N. Duque.* Ralph Nichols (Savannah River National Laboratory/USA)	**Development of a Systematic Data Evaluation Procedure for a Bioventing System to Support Site Closure.** *J.D. McNew, A.L. McGinty, F.T. Barranco, and S.R. Miller.* Jason D. McNew (EA Engineering, Science, and Technology, Inc./USA)	**8:50**
To What Extent Can C Isotopic Analysis Help Substantiate Natural Attenuation of Chlorinated Ethenes in Groundwater? *M.M. Broholm, A. Badin, D. Hunkeler, C.S. Jacobsen, and N. Just.* Mette M. Broholm (Technical University of Denmark/Denmark)	**Accelerated Site Closure Achieved after System Optimization.** *S.L. Knox and A. Mikszewski.* Sheri L. Knox (Amec Foster Wheeler/USA)	**Low-Tech In Situ Screening Approach for Biostimulant Selection.** *I.R. Schaffner, K.J. Davis, and K. Armstrong.* I. Richard Schaffner (Pennoni Associates Inc./ USA)	**9:15**
BREAK	**NAVFAC Portfolio Optimization for Sites under the Installation Restoration Program (P-Opt IRP).** *G.H. Coghlan, K.P. Brown, M.A. Singletary, and A. Gavaskar.* Gunarti H. Coghlan (U.S. Navy/USA)	**A Novel Method to Assess Bioremediation Potential of Petroleum Hydrocarbons or Herbicides in Calcareous Cold Soils.** *T. Chen, S.D. Siciliano, and M. Brummell.* Tingting Chen (University of Saskatchewan/ Canada)	**9:40**
Demonstration of Natural Attenuation of Chlorinated Ethenes through the Use of an Improved Conceptual Site Model, Compound-Specific Isotope Analysis, and Magnetic Susceptibility. *P.A. Lepczyk, D.G. Greene, M.D. Colvin, and P. Murphy.* Peter A. Lepczyk (Fishbeck, Thompson, Carr & Huber, Inc./USA)	**BREAK**	**BREAK**	**10:05**
What Have 180,000 qPCR Analyses Taught Us? Database of Concentrations of Key Microorganisms and Functional Genes. *D. Ogles, A. Biernacki, and B.R. Baldwin.* Dora Ogles (Microbial Insights, Inc./USA)	**E2. Risk Management Strategies** **Managing Emerging Contaminant Liabilities: To Sample or Not To Sample?** *W.H. DiGuiseppi and J.W. Hatton.* William H. DiGuiseppi (CH2M HILL/USA)	**F2. Biobarrier Installation and Management** **Long-Term Evaluation of Microscale ZVI and Organic Carbon Reactivity in a Permeable Reactive Barrier Application.** *J. Molin and J. Valkenburg.* Josephine Molin (PeroxyChem/USA)	**10:30**
BioPIC: A Spreadsheet-Based Decision Tool for Deducing Degradation Pathways and Selecting the Most Efficacious Bioremediation Approach for Chlorinated Ethylenes in the Subsurface. *Y. Yang, T.H. Wiedemeier, J. Wilson, C. Lebron, F. Loeffler, R. Hinchee, and M. Singletary.* Todd H. Wiedemeier (T.H. Wiedemeier & Associates, Inc./USA)	**The Role of Risk Assessment in Sustainable Remediation: A Global Perspective.** *K.A. Morris, A. Thomas, and J. Oakshott.* Kevin A. Morris (ERM/USA)	**Diffuse Downgradient Plume Management: Biobarrier Operation and Plume Delineation with HPT-GWS.** *N.T. Smith, D.D. Nguyen, M.R. Lamar, N.L. Smith, K.S. Sorenson, and S. Garcia.* Michael R. Lamar (CDM Smith/USA)	**10:55**
LUNCH	**Advances in Groundwater Plume Stability and Plume Diagnostic Evaluations.** *J.A. Ricker.* Joseph A. Ricker (Earthcon Consultants, Inc./ USA)	**Design and Installation of a Permeable Reactive Barrier for In Situ Anaerobic Bioremediation of TCE in Groundwater.** *P.T. Phillips, D.R. Kindig, P.D. Millner, and D.S. Jackson.* Patrick Phillips (BMT Designers & Planners, Inc./USA)	**11:20**

TUESDAY AFTERNOON

A Sessions
Tuttle

11:45 — A2. Advances in Biological Oxidation

Land Application of Sulfate for the Treatment of a Petroleum Hydrocarbon Source.
Y. Wei, J.F. Barker, N.R. Thomson, R. Aravena, M. Marchesi, D. Hunkeler, D. Bouchard, E. Madsen. T. Buscheck, E. Daniels, D. Segal, and R. Kolhatkar.
Ramon Aravena (University of Waterloo/ Canada)

12:10 — A2. Advances in Biological Oxidation

Field Application of Iron Oxide Nanoparticles as Electron Acceptor for the Enhancement of Microbial BTEX Degradation. *J. Bosch.*
Julian Bosch (University of Duisburg-Essen/ Germany)

12:35

LUNCH

1:00

1:25 — A3. Phytoremediation

Phytoremediation of Salt- and Hydrocarbon-Impacted Soils Using Biochar Augmentation.
A. Rutter, K. McSorley, and B. Zeeb.
Allison Rutter (Queens University/Canada)

1:50 — A3. Phytoremediation

Phytoremediation of PAHs: Designing for Success. *M.T. Jordan, L. Yang, K. Cragan, S. Colantino, M. Charles, and A. Schoonover.*
Michael T. Jordan (Terracon/USA)

2:15 — A3. Phytoremediation

Study of the Possibility of Phytoremediation of Hydrocarbon-Contaminated Soil in the Area of Abandoned Steel Production Plant "Poldi."
S. Petrova, J. Rezek, and T. Vanek.
Tomas Vanek (Institute of Experimental Botany ASCR/Czech Republic)

2:40 — A3. Phytoremediation

Extraction of Chloride from a Cement Kiln Dust (CKD) Landfill with Halophytic Grasses.
K. McSorley, A. Rutter, and B. Zeeb.
Kaitljn McSorley (Royal Military College/ Canada)

3:05 — A3. Phytoremediation

In Situ Remediation of Aromatic Amines Using Engineered_Phytoremediation℠ System (EnPhySys℠). *C. Akudo, W. Campbell, L. Day, R. Copeland, and G. Booth.*
Christopher Akudo (Toxicological and Environmental Associates, Inc./USA)

B Sessions
Monroe

11:45

LUNCH

12:10

12:35 — B3. Innovative Tools for Evaluating Vapor Intrusion Risk

State-of-the-Practice: Innovative Tools for Evaluating Vapor Intrusion Risk. *T.E. McHugh and L.M. Beckley.*
Thomas E. McHugh (GSI Environmental, Inc./ USA)

1:00 — B3. Innovative Tools for Evaluating Vapor Intrusion Risk

Passive Samplers for Vapor Intrusion Monitoring: Update on EPA's Technical Support Document and Research Results.
C. Lutes, R. Truesdale, H. Hayes, T. McAlary, H. Dawson, B. Cosky, D. Grosse, B. Schumacher, and J. Zimmerman.
Christopher C. Lutes (CH2M HILL/USA)

1:25 — B3. Innovative Tools for Evaluating Vapor Intrusion Risk

The Use of the Waterloo Membrane Sampler for Long-Term Monitoring of VOCs. *W. Wertz, T.A. McAlary, H. Groenevelt, P. Biernacka, and T. Gorecki.*
Bill Wertz (Geosyntec Consultants/USA)

1:50 — B3. Innovative Tools for Evaluating Vapor Intrusion Risk

Laboratory Simulation of Subsurface Airflow beneath a Building. *J. Corsello and D. Langseth.*
Joseph Corsello (Sanborn, Head & Associates/ USA)

2:15 — B3. Innovative Tools for Evaluating Vapor Intrusion Risk

Evaluating Vapor Intrusion Potential via Groundwater Interface Sampling.
E.C. Bonniwell, J.M. King, and C. Heckle.
Everett C. Bonniwell (Wilcox Environmental Engineering, Inc./USA)

2:40 — B3. Innovative Tools for Evaluating Vapor Intrusion Risk

Vapour Intrusion Risk Assessment: Combined Approach Using Modeling and Direct Measurement with Case Studies from Contaminated Sites in South Africa.
R.S. McKeown and S. Mohr.
Steve McKeown (ERM/South Africa)

3:05

BREAK

C Sessions
Flagler

11:45 — C1.

Retail Petroleum Site Remediation: A Case Study of How We Can Make Things Worse.
J.A. Johnson and U.B. Furrer.
Jeffrey A. Johnson (NewFields/USA)

12:10

LUNCH

12:35

1:00 — C2. Advances in Free-Product Recovery

Selection of an Optimal Site-Specific Method for the Measurement of LNAPL Transmissivity.
J.M. Hawthorne.
J. Michael Hawthorne (H2A Environmental, Ltd./USA)

1:25 — C2. Advances in Free-Product Recovery

A Comparison of Natural Source Zone Depletion and Active Remediation Rates.
T. Palaia and R. Rewey.
Tom Palaia (CH2M HILL/USA)

1:50 — C2. Advances in Free-Product Recovery

Sustainable Thermally Enhanced LNAPL Attenuation (STELA) Using Soil Solarization.
P.R. Kulkarni, C.J. Newell, V.P. Stoynova, T. Sale, M. Irianni Renno, E. Stockwell, J.E. Saadi, H. Hopkins, M. Malander, and J.H. Higinbotham.
Poonam R. Kulkarni (GSI Environmental, Inc./ USA)

2:15 — C2. Advances in Free-Product Recovery

Jet A Fuel Recovery Using Micellar Flooding: Design and Implementation. *K. Kostarelos, G.J. Hirasaki, A. Seyedabbsi, P.C. de Blanc, S. Lenschow, A.G. Christiensen, and M.A. Stylianou.*
Konstantinos Kostarelos (University of Houston/USA)

2:40 — C2. Advances in Free-Product Recovery

Innovative Surfactant System Formulations for LNAPL Recovery. *M. Kluger, J.H. Harwell, L. Wesson, M. Hasegawa, G.M. Birk, and D.F. Alden.*
Mark Hasegawa (Hasegawa Engineering/ Canada)

3:05 — C2. Advances in Free-Product Recovery

Overcoming Problematic LNAPL Recovery Sites in Montana. *J.A. Kuhn.*
Jeffrey Kuhn (MT Dept of Environmental Quality/USA)

D Sessions Brickell	E Sessions Orchid	F Sessions Jasmine	
	E2. Risk Management Strategies	F2. Biobarrier	
LUNCH	**Use of Quantum GIS to Manage Risk and Advance Complex Site Technical Understanding and Analysis.** *J. Gillespie, D. Williams, K. Brown, M. Duley, J. Wang, and J. McCrae.* Kandi L. Brown (NewFields Government Services, LLC/USA)	**Biobarrier for HCH Removal from Mine Water of a Former Uranium Surface Mine.** *P. Kvapil, L. Polach, I. Supikova, J. Machackova, M. Cernik, J. Nosek, L. Jirickova, P. Hrabak, and M. Homolkova.* Petr Kvapil (AQUATEST/Czech Republic)	**11:45**
D2. Natural Attenuation Processes			
The Missing Mass Problem: Untangling Fate and Transport Processes in Aquifers. *F.C. Payne and J.A. Quinnan.* Fred C. Payne (ARCADIS U.S., Inc./USA)	**Use of Monte Carlo Analysis to Identify and Mitigate Risk.** *P. Favara.* Paul J. Favara (CH2M HILL/USA)		**12:10**
Can Natural Attenuation Make a Dent in a Complex-Mixture DNAPL Source Area? *M. Pound, N.D. Durant, L.V. Smith, K.S. Smith, L. Maclean, C. Wanyoike, J. Willis, and G. Alyanakian.* Michael J. Pound (U.S. Navy/USA)		**LUNCH**	**12:35**
An Integrated Approach for Deducing Degradation Pathways at Sites Contaminated with Chlorinated Ethylenes. *T.H. Wiedemeier, J.T. Wilson, C. Lebron, F. Loeffler, R. Hinchee, M. Singletary, and Y. Yang.* Todd H. Wiedemeier (T.H. Wiedemeier & Associates, Inc./USA)	**LUNCH**	F3. Amendment Delivery Strategies **Full-Scale Electrokinetics-Enhanced Bioremediation (EK-BIO) of PCE DNAPL Source Area in Clay Till.** *J. Wang, E. Cox, C. Riis, M. Bymose, D. Pade, D.B. Gent, and M. Terkelsen.* James Wang (Geosyntec Consultants/USA)	**1:00**
Natural Attenuation of Nonvolatile Contaminants at the Oxic/Anoxic Interface in the Vadose Zone. *Z. Kurt and J. Spain.* Zohre Kurt (Georgia Institute of Technology/ USA)	E3. Licensed Site Remediation Professional Programs: Successes and Challenges **State of the Union: Privatization of Contaminated Property Remediation Oversight—A Survey of State Site Remediation Programs.** *R.D. Collins.* R. Duff Collins (Woodard & Curran Inc./USA)	**Conditional Closure of Tetrachloroethene Site Using Large-Diameter Treatment Column (LDTC) and Anaerobic Reductive Dechlorination.** *D. Schneider and S. Koenigsberg.* Dan Schneider (Terracon Consultants Inc./USA)	**1:25**
Natural Attenuation Pathways for Chlorinated Alkane Mixtures: Evaluating the Role of *Dehalogenimonas* in Reductive Dechlorination. *J. Chen, T.A. Key, W.M. Moe, and J.B. McReynolds.* Trent A. Key (Louisiana State University/USA)	**Evaluation of Licensed Remediation Professional Programs: A Comparison of Programs in Three States.** *J. Oberer, B. Alter, K. Cyr, G. Brookman, and L. Feldman.* John Oberer (GZA GeoEnvironmental, Inc./USA)	**Targeted Delivery of Functional Nanoparticles for Soil Remediation.** *T. Leshuk, G. Bolourani, F. Solano, B. MacLachlan, A. Kong, F. Gu, N.R. Thomson, S. Fenton, G. Sabadell, E. Zuo, and T. Hoelen.* Stuart Linley (University of Waterloo/Canada)	**1:50**
Role of Magnetite in the Abiotic Degradation of TCE in Aerobic Groundwater at the Hopewell Site. *J.T. Wilson, L. Thantu, and B.B. Looney.* John T. Wilson (Scissortail Environmental Solutions, LLC./USA)	**Five Relationship Models for Licensed Professional and Person Responsible for Conducting Remediation.** *K.F. Stetser and I. Gladstone.* Kathleen Stetser (GEI Consultants, Inc/USA)	**Overcoming Artesian Conditions: Approaches in Coupling Extraction with Injection to Achieve Perchlorate Treatment.** *C.H. Bell, J. McDonough, K.S. Houston, and E. Kalve.* Caitlin H. Bell (ARCADIS/USA)	**2:15**
Abiotic Reaction and Diffusion of TCE in Rock Matrices. *C.E. Schaefer, R.M. Towne, D.R. Lippincott, and H. Dong.* Charles E. Schaefer (CDM Smith/USA)	**Forging a New World Order: Challenges and Lessons Learned in Development of a Licensed Site Remediation Professionals Program.** *S.T. Senior.* Steven Senior (Riker Danzig Scherer Hyland & Perretti LLP/USA)	**Field-Scale Demonstration of Direct-Push/Jet Injection for Amendment Delivery.** *W.W. Slack, C. Ross, and D.E. Knight.* William Slack (FRx, Inc./USA)	**2:40**
BREAK	**The Importance of an Independent Board in Licensed Site Remediation Professional Programs: The New Jersey Experience.** *J.H. Berkowitz.* Jorge Berkowitz (Langan Engineering & Environmental Services, Inc./USA)	**BREAK**	**3:05**

TUESDAY LATE AFTERNOON

	A Sessions Tuttle	B Sessions Monroe	C Sessions Flagler
3:30	**BREAK**	**Use of a Passive Vapor Intrusion Mitigation System for Beneficial Redevelopment of a State Superfund Site.** *M. Juan and E. Page.* Kelly Ameli Smith (Land Science Technologies/ USA)	**BREAK**
3:55	**Microcosm Tests for Natural Attenuation, Biostimulation, and Bioaugmentation of Soils Contaminated with PCBs, Dioxins, PAHs, and Petroleum Hydrocarbons.** *M. Billings, Y. Nelson, C. Kitts, and K. Roberts.* Yarrow Nelson (California Polytechnic State University/USA)	**Taking the Pressure Off Subslab Mitigation Design: New Methods for Design and Performance Monitoring.** *W. Wertz, T. McAlary, P. Nicholson, and D. Mali.* Bill Wertz (Geosyntec Consultants/USA)	**The Lifecycle of MTBE in Public Water Supply Wells in California.** *T.E. McHugh, S.R. Rauch, S.M. Paquette, J.A. Connor, and A.D. Daus.* Thomas E. McHugh (GSI Environmental, Inc./ USA)
4:20	**Forest Residues Transformed by White Rot Fungi and Disinfested by Photolysis.** *N.S. Rojas, B. Quevedo, L.A. Díaz, and A.M. Pedroza.* Aura Marina Pedroza-Rodriguez (Pontificia Universidad Javeriana/Colombia)	**Model Applications for Soil Vapor Mitigation Design: Three Case Studies.** *P. Jourabchi, I. Hers, P. Hurst, G. Schmertmann, and O. Bagard.* Parisa Jourabchi (Golder Associates Ltd./ Canada)	**Optimized Remedial Strategy to Manage an Extensive MTBE Plume.** *T.K.J. Williamson, R.M. Wensink, S.M.P. Majors, J. Hawkins, J. Whitcomb, and W. Doctor.* Travis Williamson (Battelle/USA)
4:45	**Correlating Fungal Occurrence and Diversity to Contaminant Profile at the Atlantic Wood Industries Superfund Site.** *L.M. Czaplicki, R. Vilgalys, and C.K. Gunsch.* Lauren Czaplicki (Duke University/USA)	**Best Practices for Design and Operation of the Most Effective and Sustainable Active Soil Depressurization Systems.** *R. Uppencamp and K. Hoylman.* Robert Uppencamp (ARCADIS U.S., Inc./USA)	**Significance of Enhanced Aerobic Biodegradation for Accomplishing Aggressive BTEX, MTBE, and TBA Endpoints in a Large Gasoline Source Zone.** *R. Ahlers, M. Garbiero, B. Stanphil, and S. Martin.* Rick Ahlers (ARCADIS U.S., Inc./USA)
5:10	**Evaluation of Cellulolytic and Hemicellulolytic Activity of a Bacterial Consortium Inoculated in Bark of *Pinus caribaea*.** *T.A. Morris, L.M. Morris, N.S. Rojas, L.A. Diaz, and A.M. Pedroza.* Aura Marina Pedroza-Rodriguez (Pontificia Universidad Javeriana/Colombia)	**Telemetric Management–The New Standard in Vapor Intrusion Mitigation Operations, Maintenance and Monitoring (OM&M).** *T. Hatton.* Thomas E. Hatton (Clean Vapor, LLC/USA)	**Closing a Large Oxygenate Plume with a Multiple-Line-of-Evidence Approach: A California Low-Threat UST Case Closure Policy Success Story.** *D.P. DeYoung, L. White, S. VanWinkle, C. Nguyen, C. Zimmerman, and N. Voorhies.* Damon P. DeYoung (Battelle/USA)

A4. Mycoremediation

B4. Vapor Intrusion Mitigation Methods

C3. Advances in Oxygenate Remediation

POSTER GROUP 1: SCHEDULE

Display: Monday 5:00 p.m.–Tuesday 7:00 p.m.
Presentations: Tuesday 5:45–7:00 p.m.

The sessions in this group are listed on page 15, and the poster presentations are listed on pages 16-19.

During the presentation period, presenters will be available at their posters to discuss their work. A light reception will be served in the poster area during the presentations.

D Sessions Brickell	E Sessions Orchid	F Sessions Jasmine	
Investigating the Feasibility of Monitored Natural Attenuation at a Former Manufactured Gas Plant. *D. Ogles, A. Biernacki, B.R. Baldwin, J.T. Wilson, A.P. Brey, and W.L. Pence.* Dora Ogles (Microbial Insights, Inc./USA)	**BREAK**	**Accelerated Biodegradation Facilitated by an In Situ Colloidal Sorption Technology.** *K.A. Thoreson, S. Rittenhouse, J. Gravitt, and B. Mork.* Kristen Thoreson (Regenesis/USA)	**3:30**
Enhanced MNA—An Effective Closure Strategy. *H. Gill, L. Gunnell, and M. Moore.* Harch Gill (PARS Environmental, Inc/USA)	**Panel** **Do GSR Frameworks Adequately Represent Ecosystem Services and Natural Resources?** **Panel Discussion Tuesday/Track E** ***Moderator*** Rick Wice (TetraTech) ***Panelists*** Brenda Bachman (U.S. Army Corps of Engineers) Pankaj Lal, Ph.D. (Montclair State University) Carlos Pachon (U.S. EPA) Harry Stone (Battelle) Jonathon Weier (CH2M HILL)	**Performance of Full-Scale Bioremediation Remedy in Complex Geology Using Shear-Thinning Fluids.** *N.L. Smith, T.W. Macbeth, D.J. Giaudrone, R.E. Chichakli, M.S. Murphy, H. Orlean, and K. Lynch.* Neil L. Smith (CDM Smith, Inc./USA)	**3:55**
Life Cycle of a "TPH" Plume: Nature and Estimated Toxicity of Polar Metabolite Mixtures in Groundwater at Biodegrading Fuel Release Sites. *D.A. Zemo, R.E. Mohler, A.K. Tiwary, R.I. Magaw, C. Espino Devine, K.T. O'Reilly, and S. Ahn.* Kirk T. O'Reilly (Exponent, Inc./USA)		**In Situ Bioremediation Using the BioNets™ System to Passively Degrade Contaminants in Soil and Groundwater.** *W.J. Davis-Hoover and S.C. Hunt.* Wendy J. Davis-Hoover (Foremost Environmental Solutions, LLC/USA)	**4:20**
Long-Term Management of Monitored Natural Attenuation for a Hydrocarbon Plume: Lessons Learned. *B.D. Grove.* Benjamin D. Grove (MWH Americas, Inc./USA)		**Application of Biodegradable Oils (VOS™) for Treatment of cVOCs in the Vadose Zone.** *B. Yuncu, B. Elkins, B.D. Riha, B.B. Looney, W.K. Hyde, and R. Walker.* Bilgen Yuncu (EOS Remediation, LLC/USA)	**4:45**
Multiple Lines-of-Evidence Approach Used to Suspend Pump-and-Treat and Shift to Monitored Natural Attenuation: Fruit Avenue Plume Superfund Site, Albuquerque, New Mexico. *W.J. LeFevre, B.J. Canellas, S. McKinley, and B. Wied.* William J. LeFevre (CH2M HILL/USA)		**Antimethanogenic ISCR Reagent for Safer, More Efficient Remedial Actions.** *J. Peale, M. Scalzi, T. Fowler, M. Montgomery, and J. Mueller.* Jim Mueller (Provectus Environmental Products/USA)	**5:10**

D3. MNA for Achieving Site Goals

F4. Advances in Amendment Formulation

POSTER GROUP 1: SESSION TITLES

A1. Aerobic and Anaerobic Biodegradation of Organic and Inorganic Contaminants
A2. Advances in Biological Oxidation of Chloroethenes and Other Priority Contaminants
A3. Phytoremediation
A4. Mycoremediation
A5. Engineering Biogeochemical Transformation
A6. Microbial Fuel Cells
B1. Chlorinated Compound Vapor Intrusion
B2. Petroleum Hydrocarbon Vapor Intrusion
B3. Innovative Tools for Evaluating Vapor Intrusion Risk
B4. Vapor Intrusion Mitigation Methods
B5. Munitions Response Site Management Strategies
B6. Bioremediation of Munitions Constituents
C1. Remediation of Hydrocarbon Spills
C2. Advances in Free-Product Recovery
C3. Advances in Oxygenate Remediation
C4. Petroleum Hydrocarbon-Related Molecular Diagnostics
C5. Chemical Fingerprinting and Forensics
C6. Aerobic Processes for the Remediation of Petroleum Hydrocarbon Sites
D1. Tools for Assessing MNA
D2. Natural Attenuation Processes
D3. MNA for Achieving Site Goals
E1. Optimizing Existing Systems
E2. Risk Management Strategies
E3. Licensed Site Remediation Professional Programs: Successes and Challenges
F1. Strategies for Bioremediation Performance Assessment
F2. Biobarrier Installation and Management
F3. Amendment Delivery Strategies
F4. Advances in Amendment Formulation
F5. Ex Situ Biological Treatment

POSTER GROUP 1: PRESENTATIONS

A1. Aerobic and Anaerobic Biodegradation of Organic and Inorganic Contaminants

1. Use of Anaerobic Reductive Dechlorination and Cement/Ferrous Iron System for the Remediation of Chlorinated VOCs. *M. Scalzi and A. Karachalios.*
Michael Scalzi (Innovative Environmental Technologies/USA)

2. Case Study: Evaluation of a Bioremediation Process through the Injection of Emulsified Vegetable Oil (EVO). *D.S. Oliveira, B. Sciulli, and S. Loebmann.*
Flavio Coelho (ERM Brasil Ltda./Brazil)

3. Living Cells of *Stenotrophomonas maltophilia* PM102 as Natural Bioreactors for Chlorinated Hydrocarbon Remediation. *P. Mukherjee and P. Roy.*
Piyali Mukherjee (Burdwan University/India)

4. Functional Metagenomics of Microbial Communities in Groundwater for a Methylene Chloride Plume and Source Area in Bedrock. *R. Lamendella, J.R. Wright, D.A. Marabello, J. McDermott, and T. Macbeth.*
Justin Wright (Juniata College/USA)

5. Bioremediation of Source Zone and Migrated Plumes. *N.F. Blomgren, P.K. Juriasingani, and J.R. Woertz.*
Nathan Blomgren (Chevron Environmental Management Company/USA)

6. Anaerobic Biodegradation of Lindane by Mixed Dechlorinating Consortia. *L.A. Puentes Jacome, L. Lomheim, S. Gaspard, and E.A. Edwards.*
Luz A. Puentes Jacome (University of Toronto/Canada)

7. Hydrodechlorination of TCE by Pd and H_2 Produced from a Copper Foam Cathode in a Circulated Electrolytic Column at High Flow Rate. *N. Fallahpour, S.Yuan, and A.N. Alshawabkeh.*
Noushin Fallahpour (Northeastern University/USA)

A2. Advances in Biological Oxidation of Chloroethenes and Other Priority Contaminants

8. Hybrid Biological, Nanoscale Zerovalent Iron, and Electron Beam Treatment for Industrial Waste Streams. *P.G. Thill.*
Patrick G. Thill (University of Oxford/United Kingdom)

A3. Phytoremediation

9. Growth and Survivability of Poplar Trees Exposed to LNAPL Bench-Scale Pilot Test. *D. Tsao, L.G. Littrell, and N.E. Sauer.*
Nancy Sauer (URS Corporation/USA)

10. Field and Greenhouse Studies of Phytoremediation with California Native Plants for Soil with Petroleum Hydrocarbons, PAHs, PCBs, Chlorinated Dioxins/Furans, and Metals. *M.R. Poltorak, Y. Nelson, M. Curto, D. Dowd, and K. Roberts.*
Matthew R. Poltorak (MWH/USA)

11. Effects of Varying Biogeochemical Controls on Anaerobic BTEX Biodegradation in Greenhouse-Scale ABR Systems. *L. Pipkin, V. Elango, and J.H. Pardue.*
John H. Pardue (Louisiana State University/USA)

12. Germination of *Lepidium sativum* as a Method to Measure the Removal of Herbicides in Soil. *M.P. Maila, P. Randima, and T.E. Cloete.*
Mphekgo P. Maila (Agricultural Research Council/South Africa)

13. Evaluation of Soil Microbial Communities as Influenced by Crude Oil Pollution. *E.O. Nwaichi, M. Frac, P.A. Nwoha, G. Attuah, and G. Iwo.*
Eucharia Nwaichi (University of Port Harcourt/Nigeria)

A4. Mycoremediation

14. Review: Fungal Biotreatment of Petroleum Contamination. *A.R.H. Binsadiq.*
A.R.H. Binsadiq (King Saud University/Saudi Arabia)

15. A Comparative Study of the Effects of Biosurfaction, Nonionic and Ionic Surfactants on the Biological Degradation of Oil Sludge during Composting of Contaminated Soil. *H.I. Atagana.*
Harrison I. Atagana (University of South Africa/South Africa)

16. Bioremediation of Petroleum Hydrocarbons by Mangrove Fungi from Red Sea Coast of Saudi Arabia. *F. Ameen, M. Moslem, and S. Hadi.*
Fuad Ameen Saad Hasan (King Saud University/Saudi Arabia)

A5. Engineering Biogeochemical Transformation

17. Enhanced In Situ Biogeochemical Pilot Study of a Chlorinated Ethene Plume. *R. Darlington, D. Payne, J. Gillette, A. Bodour, and P. Schiff.*
Derek Payne (Battelle/USA)

18. Biogeochemical Reductive Dechlorination (BiRD) Bench Study: TCE Plume in Tampa Limestone. *M. Culbreth and J. Studer.*
Mark Culbreth (ECT Inc./USA)

19. DNAPL Source Zone and Dissolved-Phase Plume Treatment: ZVI and BiRDS Combined Remedy Strategy. *J. Studer.*
James E. Studer (InfraSUR LLC/USA)

20. Abiotic Reduction of Polychlorinated Hydrocarbons by Bioreduced Iron Oxide. *J. Das and A. Agrawal.*
Abinash Agrawal (Wright State University/USA)

A6. Microbial Fuel Cells

21. Pilot-Scale Enhanced Biodegradation of Petroleum Hydrocarbons in Soil by a Bioelectrochemical System. *S. Jin, P.H. Fallgren, L. Lu, and Z.J. Ren.*
Song Jin (University of Wyoming/USA)

22. Chromium (VI) Detection Using MFC Concept. *H.Y. Chung, E.H. Jho, W.J. Ju, and K. Nam.*
HyeonYong Chung (Seoul National University/South Korea)

23. Comparison of Alternative Proton-Exchange Membranes to Replace High-Cost Nafion Ones in Microbial Fuel Cells. *G. Hernandez-Flores, O. Solorza-Feria, H.M. Poggi-Varaldo, E. Rios-Leal, F.J. Esparza-Garcia, M.T. Ponce-Noyola, T. Romero-Castanon, and J. Galindez-Mayer.*
Giovanni Hernandez-Flores (Centro de Investigacion y de Estudios Avanzados del Instituto Politecnico Nacional/Mexico)

B1. Chlorinated Compound Vapor Intrusion

24. Modified Active Gas Sampling: A Multifaceted Approach to Environmental Site Assessment and Remedial Design of Chlorinated Solvent Contamination. *T. Nobile.*
Trevor W. Nobile (Tetra Tech/USA)

25. Bleach: A Smoking Gun? A Multiple-Lines-of-Evidence Evaluation of Vapor Intrusion Data at a Commercial Cleaning Product Facility. *E. Lovenduski, D. Folkes, and S. Gabriele.*
Eric Lovenduski (Geosyntec Consultants/USA)

B2. Petroleum Hydrocarbon Vapor Intrusion

26. Five-Year Vapor Monitoring for Risk Management at a Hydrocarbon-Polluted Site. *A. Careghini, A. Mastorgio, L. Romele, S. Saponaro, E. Sezenna, G. Bressi, and S. Micco.*
Andrea Mastorgio (Politecnico di Milano—DICA/Italy)

B3. Innovative Tools for Evaluating Vapor Intrusion Risk

27. Interpretation and Utilization of Soil-Gas Survey in Petrochemical Plants. *R. Baciocchi, I. Verginelli, and R. Pecoraro.*
Iason Verginelli (University of Rome Tor Vergata/ Italy)

28. Application of a Probabilistic Risk Assessment Approach for Quantifying Risk and Uncertainty Associated with Vapor Intrusion. *R. Wensink, I. MacGregor, B. Hawkins, M. Fuhry, A. Kubatko, and P. Rodgers.*
Ryan M. Wensink (Battelle/USA)

29. Around the School in 40 Days—Assessment and Mitigation of Vapor Intrusion Potential on an Accelerated Schedule. *W. Wertz, P.L. Brookner, A. Krasnopoler, P.J. Nicholson, and K.D. Krueger.*
Bill Wertz (Geosyntec Consultants/USA)

B4. Vapor Intrusion Mitigation Methods

30. Assessment of Vapor Migration Pathways and Remedy Implementation to Achieve Screening Levels. *M.T. Jordan.*
Michael T. Jordan (Terracon/USA)

31. Vapor Intrusion Mitigation under Surface Obstructions Using Horizontal Environmental Wells: Applications and Results. *J.M. Doesburg.*
James M. Doesburg (Directed Technologies Drilling, Inc./USA)

32. Vapor Intrusion Mitigation Issues Associated with Mercury-Impacted Soil and Groundwater. *D.J. Russell, C.P. Wong, and A. Lewis-Russ.*
David J. Russell (AECOM/USA)

33. Control of Methane Intrusion in a Large Shopping Mall in Sao Paulo City, Brazil. *G.D.C. de Mello and R. Lattouf.*
Gustavo de Mello (ENVIRON/Brazil)

34. Performance of an Active Aerated Floor Vapor Intrusion Mitigation System in a Large Building. *L. Fitzgerald, D. Folkes, and R.C. Daprato.*
Luke Fitzgerald (Geosyntec Consultants/USA)

B5. Munitions Response Site Management Strategies

35. Geophysical and UXO Operations In Support of Soil Remediation, Southeast Kuwait. *R. Lahti, G. Cuthbert, R. Getchell, and D. Al-Gharabally.*
Raye Martin Lahti (Amec Environment & Infrastructure/USA)

B6. Bioremediation of Munitions Constituents

36. Production, Fate, and Transport of Microscale Energetic Residues. *M.E. Fuller, C.E. Schaefer, C. Andaya, and S. Fallis.*
Mark E. Fuller (CB&I Federal Services/USA)

37. Engineering *Arabidopsis* to Detoxify the Environmental Pollutant and Explosive 2,4,6-trinitrotoluene (TNT). *K. Tzafestas, V. Gunning, H. Sparrow, E.J. Johnston, A.S. Brentnall, J.R. Potts, E.L. Rylott, and N.C. Bruce.*
Kyriakos Tzafestas (University of York/United Kingdom)

38. Simulating Biodegradation Kinetics of TNT to TAT via Isomeric DANTs/ADNTs for Bioremediation at TNT-Contaminated Sites. *A. Gupta and M.A. Widdowson.*
Ankit Gupta (AECOM/USA)

39. Optimization of Remedial Approach for Treatment of Contaminated Groundwater at a Former Munitions Constituent Manufacturing Facility. *S.T. Downey and R.L. Meadows.*
Steven T. Downey (CB&I/USA)

40. Natural Attenuation of RDX on an Active Hand Grenade Range. *J. Won and R.C. Borden.*
Jongho Won (North Carolina State University/ USA)

41. A Study of Microbial and Geochemical Responses to Substrate Injections for RDX Biotreatment of Groundwater. *R. Britto, R. Arnseth, and D. Grady.*
Ronnie Britto (Tetra Tech, Inc./USA)

42. Microbially Mediated 2,4-Dinitroanisole (DNAN) Degradation by Reduced Electron Shuttles. *J.B. Niedzwiecka, M.A. Schlautman, and K.T. Finneran.*
Jolanta B. Niedzwiecka (Clemson University/USA)

C1. Remediation of Hydrocarbon Spills

43. Numerical Simulation of Low-Temperature In Situ Thermal in DNAPL Source Zone Remediation. *A.Y. Fu, S. Finsterle, and M.D. Annable.*
Amy Fu (Ellis & Associates, Inc./USA)

44. Comparative Trials of Proprietary Additives, Organic Manure and Inorganic Fertilizers on the Bioremediation of Crude Oil-Impacted Soil. *A.M. Lee, G. Adams, and S. Eze.*
Curtis C. Stanley (Shell Global Solutions/USA)

C2. Advances in Free-Product Recovery

45. In Situ Geochemical Stabilization (ISGS) for Nonaqueous-Phase Liquid Treatment: Technical Assessment. *M. Scalzi and A. Karachalios.*
Michael Scalzi (Innovative Environmental Technologies/USA)

46. Colloidal Ferrofluids Revisited: Current Research in Magnetic NAPL Recovery. *B.J. Harding and D. Bogdan.*
Barry J. Harding (AECOM Technical Services, Inc./USA)

47. Remedial Design Characterization and High-Resolution Sampling to Design Pilot-Scale Injection for LNAPL Remediation. *D. Guilfoil and P. Ejlskov.*
Duane Guilfoil (AST Environmental, Inc./USA)

48. Nationwide (USA) Statistical Analysis of LNAPL Transmissivity. *J.M. Hawthorne.*
J. Michael Hawthorne (H2A Environmental, Ltd./ USA)

49. Improving Petroleum Remedy Sustainability by Coupling Biological and Physical Remediation Technologies. *C. Martin and T. Fowler.*
Troy Fowler (BIOS, Inc./USA)

C3. Advances in Oxygenate Remediation

50. Bioremediation of Tert Butyl Alcohol (TBA) in Low-Permeability Soil. *L. Zeng, S. Abrams, K. Tyson, and M. Wenrick.*
Lingke Zeng (Langan Engineering & Environmental Service, Inc./USA)

C4. Petroleum Hydrocarbon-Related Molecular Diagnostics

51. Biodegradation of Anthracene by *Paenibacillus* sp. HD1PAH Supplemented with Biosurfactant of *Pseudomonas aeruginosa* H7h. *H. Deka and J. Lahkar.*
Hemen Deka (Institute of Advanced Study in Science & Technology/India)

52. Solitary Extradiol Dioxygenase Gene Supports the Biodegradation of Aromatic Hydrocarbons. *M.V. Brennerova, J. Josefiova, V. Brenner, and M. Stavelova.*
Maria V. Brennerova (Czech Academy of Sciences/Czech Republic)

C5. Chemical Fingerprinting and Forensics

53. Source Characterization Using Environmental Forensics at Complex Petroleum-Impacted Sites. *J. Lu.*
Jun Lu (AECOM/USA)

54. Development of Environmental Forensic Technique in Source Identification of Diesel Fuel-Contaminated Sites in Taiwan. *C.S. Chen, C.-J. Tien, and S.-R. Ciou.*
Colin S. Chen (National Kaohsiung Normal University/Taiwan)

55. Treatment Optimization through Refinement of a Conceptual Site Model Using Compound-Specific Isotope Analysis. *G. Smith and Y. Wang.*
Gregory J. Smith (ERM, Inc./USA)

56. Forensic Analysis and Modeling of LNAPL Properties to Craft Robust LNAPL Conceptual Site Models. *J.M. Hawthorne.*
J. Michael Hawthorne (H2A Environmental, Ltd./ USA)

POSTER GROUP 1: PRESENTATIONS

57. Using Environmental Forensic Compound-Specific Isotope Analysis (CSIA) to Determine Potential Off-Site Releases of Chlorinated Solvents at a Former Manufacturing Facility. *J.E. Refermat, J. Kelly, and T. Schwendeman.*
Jim Refermat (AECOM/USA)

58. Petroleum Hydrocarbon Forensics Demonstrate Ongoing Releases at Legacy Upstream Site. *J.K. Sueker, D.R. Hoffman, M. Sarkar, and S.J. Morey.*
Julie Sueker (ARCADIS U.S., Inc./USA)

C6. Aerobic Processes for the Remediation of Petroleum Hydrocarbon Sites

59. Measurement of CO_2 Flux for Quantification of Natural Source Zone Depletion and Evaluation of Air Sparging Influence on Source Zone Depletion. *D.P. Stankus and D. de Courcy-Bower.*
Dylan Paul Stankus (ERM/USA)

60. Dynamic Chemical Responses to Active Treatment. *G. Smith, N. Ryan, and S. Giliam.*
Noel Ryan (Huntsman Polyurethanes Pty Ltd/ Australia)

61. Passive Gas Delivery and Ozone Injections to Treat TPH and LNAPL Adjacent to a Tidally Influenced Estuary. *M.A. Panciera, P.H. Gratton, and T. Kalinowski.*
Matthew A. Panciera (AECOM/USA)

62. Application of Physical Removal and Aerobic Bioremediation of Petroleum Hydrocarbons Using Innovative Well Designs. *M. Pachal, W. Xiong, C. Mathies, J. Grosskleg, and T. Carlson.*
Marshall Pachal (Stantec Consulting Ltd./Canada)

63. Multifaceted Approach to the Remediation of a Petroleum Hydrocarbon Plume at an Active Retail Service Station. *B. Rakewich, K. Jackson, and T. Carlson.*
Kyle Jackson (Nichols Environmental [Canada] Ltd./Canada)

64. Risk Evaluation and Mitigation of Corrosion on Underground Utilities for Ozone Sparging. *J. Lin, J. Leu, and S. Ferris.*
Joann Lin (Parsons Corporation/USA)

65. Remediation and Restoration of the Lac-Mégantic, Québec, Crude Oil Train Disaster. *B. Noble, T. Schwendeman, J. Marcotte.*
Bruce Noble (AECOM/Canada)

D1. Tools for Assessing MNA

66. Lessons Learned from NSZD Evaluation–CO_2 Flux and Temperature Measurements at an Active Refinery. *S. Subramanian, R.E. Sweeney, and A. Kirkman.*
Shankar Subramanian (AECOM/USA)

67. A New Way of Looking at Plumes Using Tools Derived from the Ricker Method™ Plume Stability Analysis. *E.W. Lee and J.A. Ricker.*
Emily W. Lee (EarthCon Consultants, Inc./USA)

68. Geoelectrical Characterization and Monitoring of Hydrocarbon Degradation. *D. Ntarlagiannis, L.D. Slater, C. Kimak, P. Argyrakis, E.A. Atekwana, and S. Rossbach.*
Dimitrios Ntarlagiannis (Rutgers University - Newark/USA)

69. Utilization of QuantArray-Chlor™ and QuantArray-Petro™ Analyses to Evaluate Natural Attenuation at a Superfund Site. *M. Heintz, J. Sueker, M. Gefell, C. Bell, J. Holden, and B. Thompson.*
Monica Heintz (ARCADIS U.S. Inc./USA)

70. Integrating Microbial and Geophysical Methods for Determining Biodegradation Pathways. *C. Beaver, A. Williams, S. Rossbach, E. Atekwana, E. Atekwana, L. Slater, and D. Ntarlagiannis.*
Carol Beaver (Western Michigan University/USA)

71. Modeling Thermal Anomalies to Estimate the Biodegradation Rates of Hydrocarbon Degradation. *J. Zimbron, E. Kasyon, and S. Gadaleta.*
Julio Zimbron (Colorado State University/USA)

72. An Integrated, State-of-the-Art Approach for Evaluating Monitored Natural Attenuation. *T.H. Wiedemeier, M.J. Pound, and R. Wong.*
Todd H. Wiedemeier (T.H. Wiedemeier & Associates, Inc./USA)

D2. Natural Attenuation Processes

73. Sequential Reducing/Oxidizing/Reducing Conditions Enhances Natural Attenuation at Naval Air Station Whiting Field, FL. *F.H. Chapelle, P.M. Bradley, and A. Olsen.*
Francis H. Chapelle (U.S. Geological Survey/USA)

74. Field Comparison of NSZD Assessment Methods: Gradient Method and Two CO_2 Flux Methods. *S. Gaito, A. Pennington, J. Smith, B.W. Koons, H. Hopkins, and M.W. Malander.*
Rick Ahlers (ARCADIS U.S., Inc./USA)

75. Natural Source Zone Depletion Rates from Subsurface Temperature Data: A Quantitative Analysis. *S. Gaito, A. Pennington, J. Smith, B.W. Koons, and J.C. LaChance.*
Rick Ahlers ((ARCADIS U.S., Inc./USA)

76. Reductive Dechlorination of Vinyl Chloride in the Absence of *Dehalococcoides mccartyi*. *Y. Yang, J. Yan, and F.E. Loeffler.*
Yi Yang (University of Tennessee, Knoxville/USA)

77. Natural Source Zone Depletion Rate Measurements to Support LNAPL Remediation Decision Making. *K. Piontek, S. Deters, K. Woodburne, and J. Leik.*
Jason Leik (TRC Environmental Corporation/USA)

78. Natural Source Zone Depletion Rate Measurements to Support Determination of an Appropriate LNAPL Recovery Endpoint. *K. Piontek, T. Sale, and S. Deters.*
Jason Leik (TRC Environmental Corporation/USA)

D3. MNA for Achieving Site Goals

79. Natural Attenuation Evaluation Using Multiple Lines of Evidence: Fruit Avenue Plume Superfund Site, Albuquerque, New Mexico. *W.J. LeFevre, B.J. Canellas, S. McKinley, and B. Wied.*
William J. LeFevre (CH2M Hill/USA)

80. Strategies for Managing Contaminated Properties: Integrating Chemical and Biological Remediation. *C.L. Conover, R.Y. Koto, and K.R. McPartland.*
Colleen Conover (Langan Engineering/USA)

E1. Optimizing Existing Systems

81. A Rapidly Deployable Automated Remedial Injection System—Sustainability Elements and Operational Experiences. *E. Gyles, T. Pac, and S. Carvalho.*
Timothy Pac (ERM/USA)

82. The Role of the Quality Assurance Process in Long-Term Project Optimization. *G.L. Kirkpatrick.*
Gerald L. Kirkpatrick (Environmental Standards, Inc./USA)

83. Rapid, High-Resolution Site Characterization to Optimize Enhanced Bioremediation of a Chlorinated Solvent Plume. *J.W. Schuetz, J.R. Hicks, and I.R. Bowen.*
James W. Schuetz (Parsons/USA)

84. Utilizing an Engineered Wetland to Remediate Shallow Groundwater Impacted with Chlorinated Ethenes. *D. Tsao, M. Wojciechowski, and N.E. Sauer.*
Nancy Sauer (URS Corporation/USA)

85. Ten-Year Review of the Application of Modified Active Gas Sampling. *Z. He and R. Lewis.*
Ziqi He (Conestoga-Rovers & Associates, Inc./ USA)

86. Complex Site Remedial Management Optimization Utilizing Cloud Computing Systems. *L. Deschaine, M. Wilson, T. Hazlett, and T. Fox.*
Tim Hazlett (HGL/USA)

87. Use of Advanced Techniques to Maximize Amendment Delivery in Challenging Geologies. *P.K. Juriasingani, N.F. Blomgren, J.P. O'Neal, and J.R. Woertz.*
Purshotam Juriasingani (AECOM/USA)

88. Source Area Management Using Membrane Interface Probe and Enhanced Anaerobic Bioremediation. *N. Smith, M. Lamar, N. Smith, K. Sorenson, and S. Garcia.*
Dung Nguyen (CDM Smith/USA)

E2. Risk Management Strategies

89. Nitrate: Manage Risk by Understanding the Dynamic Nitrogen Conceptual Site Model. *L. Neary, D.K. Nelson, D. Vance, and J. Sueker.*
Julie Sueker (ARCADIS U.S., Inc./USA)

90. Health Risk Assessment and Risk Management on a Contaminated Groundwater Site in Taiwan. *C.-T. Wu, .I-C. Chen, M.H. Ko, and C.C. Kao.*
Mao-Hui Ko (Sinotech Environmental Technology, LTD/Taiwan)

E3. Licensed Site Remediation Professional Programs: Successes and Challenges

91. Turning a Brownfield Site into a Health Center. *F. Vetere, R. Parkman, and J. Yeager.*
Karen Kinsella (GZA GeoEnvironmental, Inc./USA)

F1. Strategies for Bioremediation Performance Assessment

92. Use of Modern Molecular Technologies for Evaluating Electron Acceptors for Anaerobic Bioremediation of Petroleum Hydrocarbons. *D.F. Alden and G.M. Birk.*
David F. Alden (Tersus Environmental, LLC/USA)

93. Utilizing Respirometry to Assess the Potential for Bioremediation. *R. Dolly.*
Richard Dolley (Environmental Business Specialists, LLC/USA)

94. Comparison of Chlorinated Ethene Degradation Rates and Geochemical Conditions at 40 Enhanced Reductive Dechlorination Sites. *J.M. Tillotson and R.C. Borden.*
Jason Tillotson (North Carolina State University/USA)

95. Encountering Microbial Issues While Implementing Aerobic Bioremediation. *J. Sheldon, J. Friedman, C.A. Sandefur, and D. Nunez.*
Jack Sheldon (Antea Group/USA)

F2. Biobarrier Installation and Management

96. Microdiffusion of Pure Oxygen in Groundwater Contaminated by Biodegradable Organic Compounds and Metals. *A. D'Anna, R. Brutti, A. Gigliuto, M. Peroni, E. Pasinetti, and G. Bissolotti.*
Andrea D'Anna (AECOM/Italy)

97. The Application of ISCR Chemistries for Enhanced Dehalogenation of Contaminated Groundwater Using Permeable Reactive Barriers. *C. Akudo, R. Copeland, and G. Booth.*
Christopher Akudo (Toxicological and Environmental Associates, Inc/USA)

98. Testing of a Permeable Reactive Barrier and Engineered Wetland for Metals Removal in a Remote Location. *A. Weston, S. Dore, D. Pope, and C. Bucior.*
Sophia Dore (Conestoga-Rovers and Associates/GHD/USA)

99. Applications of Combined Biotic and Abiotic Processes to Establish a TCE Permeable Reactive Barrier. *D. Leigh and C. Bruno.*
Daniel P. Leigh (PeroxyChem LLC/USA)

100. Maximizing Performance and Minimizing Cost of EVO PRBs. *R.C. Borden and B. Elkins.*
Brad Elkins (EOS Remediation/USA)

101. Use of Constructed Wetlands to Remediate LNAPL-Contaminated Groundwater on Former Industrial Property. *D.M. Vredenburg, T. McDonald, G. Cortese, A. Wells, O. Sinai, R. Chong, N. Kulkami, and K. Lund.*
Daniel Vredenburg (University of Michigan/USA)

F3. Amendment Delivery Strategies

102. Bioaugmentation Using Recirculating Systems in Horizontal Wells: Strategies and Successes. *D.W. Ombalski, M. Lubrecht, and B. Timmons.*
Dan Ombalski (Directed Technologies Drilling/USA)

103. Coupling GCWs and Biological RD for Effective DNAPL Source Removal: From the Lab Investigation to the Pilot Scale. *M. Petrangeli Papini, M. Majone, L. Pierro, M. Sagliaschi, S. Sucato, E. Alesi, and E. Barstch.*
Marco Petrangeli Papini (University of Rome "La Sapienza"/Italy)

104. Emulsified Vegetable Oil Delivery Methods at an Active Manufacturing Facility. *L. Sweet, M.S. Kovacich, S. Dettloff, and S. Bagby.*
Lesa A. Sweet (Tetra Tech/USA)

105. An Innovative Bioremediation Technology for Treating Chlorinated VOCs in Low-Permeability Saturated Soils. *B. Elkins, M. Yeh, E. Alperin, and S. Uesawa.*
Brad Elkins (EOS Remediation/USA)

106. Factors Affecting Preparation and Injection of Shear-Thinning Fluids for Delivery of Bioremediation Amendments. *N.L. Smith, T.W. Macbeth, D.J. Giaudrone, R.E. Chichakli, M.S. Murphy, H. Orlean, and K. Lynch.*
Neil L. Smith (CDM Smith, Inc./USA)

107. EISB Treatment of Chlorinated VOCs by Biobarrier and Source Approach. *E. Schleicher, M. Kozar, and B. Bakrania.*
Eric Schleicher (O'Brien & Gere/USA)

108. Horizontal Remediation Injection Wells (HRIW): Solution to Slow Uptake via Vertical Injection Wells. *M. Sequino, K. Martin, and J.A. Irwin.*
Mike Sequino (Directional Technologies, Inc./USA)

109. Shallow Soil Mixing of Lime-Catalyzed Persulfate for Treatment of Organochlorine Pesticides in the Saturated Zone. *K.A. Morris and D. Brown.*
Kevin A. Morris (ERM/USA)

F4. Advances in Amendment Formulation

110. Antimethanogenic, Liquid ERD Amendment for Safer Remedial Actions. *J. Mueller and J. Haselow.*
Jim Mueller (Provectus Environmental Products/USA)

111. Antimethanogenic Supplement for ERD Amendments. *C. Nelson and J. Mueller.*
Jim Mueller (Provectus Environmental Products/USA)

112. Enhancing the Efficiency of Electron Donor Utilization in Bioremediation of Chlorinated Solvents. *J. Sankey, G.M. Birk, and D.F. Alden.*
John Sankey (True Blue Technologies Inc./USA)

113. Sulfidated Zero-Valent Iron for Remediation of Chlorinated Contaminants. *Y.L. Han and W.L. Yan.*
Yanlai Han (Texas Tech University/USA)

114. Improving Performance and Reducing Costs with Combined EVO and ZVI. *R.C. Borden, B. Elkins, and S.R. Shrestha.*
Bilgen Yuncu (Solutions-IES, Inc./USA)

F5. Ex Situ Biological Treatment

115. Sustainable Wastewater Treatment at the Boston Mills Historic District Cuyahoga Valley National Park, Brecksville, OH. *J. Popielski and N.E. Sauer.*
Nancy Sauer (URS Corporation/USA)

116. Comparisons of Biotic, Abiotic, In Situ, and Ex Situ Methods for Remediation of Mining-Influenced Water. *N.T. Smith, N.R. Anton, K. Saller, R.L. Olsen, D.J. Reisman, A.K. Frandsen, and K.S. Whiting.*
Dung Nguyen (CDM Smith/USA)

117. Wastewater Treatment Coupled with Chromium Metal Recovery and Energy Production using Microbial Fuel Cell. *P. Gangadharan and I.M. Nambi.*
Indumathi M. Nambi (Indian Institute of Technology Madras/India)

WEDNESDAY MORNING

	A Sessions Tuttle	B Sessions Monroe	C Sessions Flagler
8:00	**A5. Engineering Biogeochemical Transformation** **Biogeochemical Transformation of Trichloroethene in Engineered Iron Sulfide Systems.** *P. Evans, J. Smith, D. Nguyen, N. Smith, K. Whiting, R. Chappel, B. Henry, A. Bodour, J. Gillette, C. Lebron, and J. Wilson.* Patrick J. Evans (CDM Smith/USA)	**B5. Munitions Response Site Management Strategies** **State-of-the-Practice: Military Munitions Response Program.** *L. Clarke, G.L. Warren, C. Cora, J.E. Peach, and O. Broadway.* Les Clarke (Battelle/USA)	**C4. Petroleum Hydrocarbon-Related Molecular Diagnostics** **Molecular Characterization of a Biosparging Site.** *S. Fiorenza, S. Lummus, and J. Nyall.* Stephanie Fiorenza (BP/USA)
8:25	**Laboratory Study of Iron Amendments Used to Facilitate Reductive Dechlorination of TCE in High-Sulfate Groundwater.** *H. Matis, M. Harkness, P. Hare, R. Morse, and J. Uruskyj.* Hope Matis (GE Global Research/USA)	**Munitions Response Site Management: An Auditor's Perspective.** *D. Murray.* Douglas Murray (Tetra Tech, Inc./USA)	**The Use of Metaproteomics to Characterize North Slope Sediments Exposed to Crude Oil.** *C. Bartling, C. Howland, and L. Mullins.* Craig M. Bartling (Battelle/USA)
8:50	**Combining In Situ Chemical Reduction and Biogeochemical Degradation to Treat Chlorinated Ethenes in High-Sulfate Aquifers.** *D. Leigh and S. Owen.* Daniel P. Leigh (PeroxyChem LLC/USA)	**Upgrading the Munitions Classification Polarizabilities Library.** *B. Barrow, T. Bell, G. Harbaugh, D. Steinhurst, N. Khadr, and C. Murray.* Nagi Khadr (Parsons/USA)	**Identifying Active Microbial Communities during In Situ Hydrocarbon Degradation in Cold Soils Using Heavy Phosphate.** *A. Schebel, S. Siciliano, and T. Winsley.* Alixandra Schebel (University of Saskatchewan/ Canada)
9:15	**Bedrock Applications of Biogeochemical Reductive Dechlorination (BiRD).** *M. Burns and J.E. Studer.* Matthew Burns (WSP/USA)	**Adaptations to Digital Geophysical Mapping (DGM) Instrument Verification Strip (IVS) Metrics to Account for Rough Terrain: A Case Study.** *M.W. Zelenevich, M.W. Blohm, F.L. Clarke, and J.E. Peach.* Max William Zelenevich (Battelle/USA)	**Microorganisms Indicative of Anaerobic Benzene Degradation Potential in Groundwater Systems.** *F. Luo and E.A. Edwards.* Fei Luo (University of Toronto/Canada)
9:40	**Evaluation of Engineered and Natural Biogeochemical Transformation at Multiple Chlorinated Ethene Sites.** *J. Gamlin, D. Downey, D. Williamson, G. Anderson, L. Duke, S. Bowen, and V. King.* Jeff Gamlin (CH2M HILL/USA)	**BREAK**	**Development and Application of an RT-qPCR Assay Targeting Anaerobic Benzene Carboxylase (abcA) Gene Expression in Hydrocarbon-Contaminated Groundwater.** *E. Madsen, C. DeRito, M. Marchesi, Y. Wei, R. Aravena, J.F. Barker, N.R. Thomson, D. Hunkeler, D. Bouchard, T. Buscheck, E. Daniels, and R. Kolhatkar.* Eugene L. Madsen (Cornell University/USA)
10:05	**BREAK**		**BREAK**
10:30	**A6. Microbial Fuel Cells** **Bioelectrochemically Enhanced Remediation of Hydrocarbon-Contaminated Soil: Amplification from Bench- to Pilot-Scale.** *L. Lu, Z.J. Ren, P. Fallgren, S. Jin, and Y.E. Zuo.* Zhiyong Jason Ren (University of Colorado Boulder/USA)	**B6. Bioremediation of Munitions Constituents** **Novel Microorganisms Linked to RDX Degradation across Soil Communities.** *I. Jayamani and A.M. Cupples.* Alison M. Cupples (Michigan State University/ USA)	**C5. Chemical Fingerprinting and Forensics** **Forensic Evaluation of Historic Fuel Releases at the J3 Pumphouse, Davis-Monthan Air Force Base, Arizona.** *J. Hess, L. Phillips, and K. Oden.* Jeffrey D. Hess (Gilbane Federal/USA)
10:55	**Life Cycle Environmental and Cost Assessment of Microbial Electrochemical Cells and Conventional Technologies for Wastewater Treatment at Forward Operating Bases.** *M. Bogosh, P. Richards, P. Evans, T. Nguyen, E. Guven, M. Young, C. Torres, and B. Logan.* Michaela Bogosh (CDM Smith/USA)	**Evaluation of RDX Biodegradation Using C and N Stable Isotope Analysis.** *P.B. Hatzinger, M.E. Fuller, L. Heraty, and N.C. Sturchio.* Paul B. Hatzinger (CB&I Federal Services/USA)	**Source Identification by Advanced and Tiered Analytical Tools.** *D. Kong, R. Nelson, and C. Reddy.* Deyuan Kong (Chevron/USA)
11:20	**Application of Microbial Fuel Cell to Treat Pyrite-Containing Mine Tailings.** *W.J. Ju, E.H. Jho, H.Y. Chung, and K. Nam.* Eun Hea Jho (Hankuk University of Foreign Studies/South Korea)	**A Pilot- to Full-Scale Success Story: Combined Anaerobic Biostimulation and Aerobic Bioaugmentation for Explosives-Contaminated Groundwater Cleanup.** *M. Michalsen, S. Gelinas, A. King, E. Wilson, R. Wilson, F. Crocker, C. Jung, K. Indest, M. Fuller, P. Hatzinger, and J. Istok.* Mandy M. Michalsen (USACE/USA)	**The Use of Trace Evidence in Environmental Forensics in Determination of Source and Fate of Pollutants.** *R.P. Philp.* R. Paul Philp (University of Oklahoma/USA)

D Sessions Brickell	E Sessions Orchid	F Sessions Jasmine	
Panel **Sampling Groundwater Monitoring Wells: Is What's in the Pipe Representative of the Formation?** **Panel Discussion Wednesday/Track D** ***Moderator*** Rick Cramer (AECOM) ***Panelists*** Michael Barcelona (Western Michigan University) Sandy Britt (ProHydro Inc.) Murray Einarson (Haley and Aldrich) John Gillespie (Air Force Civil Engineer Center) Noah Heller (BESST, Inc.)	**E4. Best Practices in GSR** **The Growing Impact of ASTM's New Standard Guide for Greener Cleanups.** *C.F. Silver, D.R. Goldblum, and J.A. Simon.* Cannon F. Silver (CDM Smith/USA)	**F5. Ex Situ Biological Treatment** **A Sustainable Bioremediation Approach for Chloroethane-Contaminated Groundwater Treatment.** *M. Cheatham, V.K. Elango, and J. Pardue.* Micheal Cheatham (Geosyntec Consultants/ USA)	**8:00**
	Synergy between Optimization, Green and Sustainable Remediation, and Green Remediation Practices across Federal Agencies. *C.L. Dona, A. Hawkins, K. Biggs, C. Pachon, and D. Goldblum.* Carol Lee Dona (U.S. Army Corps of Engineers/ USA)	**Long-Term Remediation of Water Polluted with Perchloroethylene.** *L.M. Breton-Deval, H.M. Poggi-Varaldo, E. Rios-Leal, J. Galindez-Mayer, O. Solorza-Feria, and S. Rossetti.* Luz Breton-Deval (Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional/Mexico)	**8:25**
	How Can a Green Remediation Project Benefit by Incorporation of Sustainability? *M.E. Miller, M.A. Harclerode, and P. Lal.* Michael E. Miller (CDM Smith/USA)	**Degradation of PCBs in a Compost System with a Thermophilic Aerobe.** *K. O'Driscoll, R.M. DiFilippo, P. Piccillo, S. Koenigsberg, R. Sambrotto, and J. Guarnaccia.* Kevin O'Driscoll (Thermocyclomics LLC/USA)	**8:50**
	Socioeconomic and Environmental Considerations for Optimizing Remedial Design of a Mixed-Use Contaminated Site in India. *N. Singh, S. Bhatia, J. Sathaye, and J. Parikh* Jaydeep Parikh (ERM India Private Limited/ India)	**Co-Composting of Soil Impacted by Hydrocarbons.** *E. Bergeron, C. Gosselin, S. Hains, and J. Côté.* Eric Bergeron (Golder Associates, Ltd./Canada)	**9:15**
BREAK	**SURF USA's Case Study Initiative Identifies Sustainable Remediation Trends.** *J.A. Simon.* John A. Simon (Gnarus Advisors/USA)	**BREAK**	**9:40**
D4. Fate and Transport of Biofuels **Results of 2-D Numerical Modeling Study of the Influence of Methane Generation from Ethanol-Gasoline Blends on Vapor Intrusion.** *I. Hers, P. Jourabchi, and K. Ulrich Mayer.* Ian Hers (Golder Associates Ltd./Canada)	**BREAK**	**F6. Biodegradation in Fractured Bedrock Sites** **Assessment and Biological Treatment of DNAPL Sources in Fractured Bedrock.** *C.E. Schaefer, G. Lavorgna, T. Ault, E.B. White, and M.D. Annable.* Graig Lavorgna (CB&I Federal Services/USA)	**10:05**
Fate of Methane and Ethanol-Blended Fuels in Soil: Laboratory and Field Experiments. *D. Mackay, N. de Sieyes, J. Peng, R. Schmidt, M. Felice, M. Buelow, J. Emmons, N. Spadone, M. Tsumura, L. Zivalic, and K. Scow.* Douglas M. Mackay (University of California-Davis/USA)	**E5. Incorporating GSR into Remedy** **Future Land Use and Sustainable Remediation at the Sydney Tar Ponds: A Case Study and Lessons Learned on Adaptive Remedial Design.** *B. Noble, D. Wilson, D. Burke, and D. MacDonald.* Bruce Noble (AECOM/Canada)	**A Dual Biorecirculation System to Facilitate VOC Mass Reduction and Hydraulic Control in Fractured Bedrock.** *J.T. Bamer, M.R. Lamar, N.L. Smith, M.J. Smith, and K.S. Sorenson.* Jeff T. Bamer (CDM Smith/USA)	**10:30**
Controls on Ethanol and BTEX Distribution and Fate Following a Major Release. *A. Madsen, R. Wilson, and J. Grosskleg.* Aaron Madsen (Amec Foster Wheeler Earth & Infrastructure/Canada)	**Application of Green and Sustainable Remediation Means and Methods in the Remedial Closure of a Former Lead Smelter Site.** *D.T. Heidlauf, S.M. McGinnis, and J.M. Kupar.* David T. Heidlauf (ENVIRON International Corp./ USA)	**Innovative Top-Down Pilot Test for Bioremediation of TCE in Fractured Carbonate Bedrock.** *P. Hare, R. Morse, M.R. Harkness, M. Watling, and J. Uruskyj.* Paul W. Hare (O'Brien & Gere/USA)	**10:55**
Physical Model Experiments and Simulations of Releases of Alcohol Blended Fuels. *Y. Zhang, L.L Quon, J. Ma, P.J.J. Alvarez, and W.G. Rixey.* William G. Rixey (University of Houston/USA)	**Sustainable Thermally Enhanced Bioremediation at a Methylene Chloride Site in the UK.** *J. Baldock, A.O. Thomas, S. Tillotson, and J. Dablow.* James Baldock (ERM/United Kingdom)	**Bioaugmentation of DNAPL in Fractured Bedrock and Low-Permeability Soil.** *L. Zeng, K. Subramanian, and S. Abrams.* Lingke Zeng (Langan Engineering & Environmental Service, Inc./USA)	**11:20**

WEDNESDAY AFTERNOON

	A Sessions Tuttle	B Sessions Monroe	C Sessions Flagler
11:45	**A6. Microbial Fuel** **Leachates from Sanitary Landfill Treated in a Microbial Fuel Cell Equipped with a Low-Cost Membrane.** *G. Hernandez-Flores, O. Solorza-Feria, H.M. Poggi-Varaldo, E. Rios-Leal, F.J. Esparza-Garcia, M.T. Ponce-Noyola, J. Galindez-Mayer, and T. Romero-Castanon.* Giovanni Hernandez-Flores (Centro de Investigacion y de Estudios Avanzados del Instituto Politecnico Nacional/Mexico)	**B6. Bioremediation of Munitions** **Biodegradation of the Insensitive Explosive 2,4-Dinitroanisole.** *J. Spain, T. Fida, S. Karthikeyan, S. Palamuru, and G. Pandey.* Jim Spain (Georgia Institute of Technology/ USA)	**C5.** **Determination of the Vertical and Horizontal Extent of Subsurface Hydrocarbon Fuel Releases Using Environmental Forensic EPA Method TO-15/SW8260B and Mining Visualization Software.** *J.E. Refermat, J. Price, J. Chastain, and A. Eddington.* Jim Refermat (AECOM/USA)
12:10		**Environmental Fate and Transport of a New Military Explosive, IMX-101.** *J. Weidhaas and T. Richard.* Jennifer L. Weidhaas (West Virginia University/ USA)	
12:35	**LUNCH**		**LUNCH**
1:00	**A7. Combined Remedies for VOCs** **Integrated Treatment Design for Remediation of Chlorinated Solvents.** *H. Hinrichsen, J. Bergman, and G. Leonard.* Helena M. Hinrichsen (RGS 90 Sverige AB/ Sweden)	**LUNCH**	**C6. Aerobic Processes for the Remediation of Petroleum Hydrocarbon Sites** **Sustainable Bioremediation of Petroleum Hydrocarbon Impacts Using Hydrogen Peroxide as a Biostimulant.** *T. Carlson, S. Cruz, R. Wells, and A. Haberli.* Trevor Carlson (Federated Co-operative Ltd./ Canada)
1:25	**Combined Biological and Chemical Technologies for In Situ Remediation of Chlorinated Ethenes at the MARS Site.** *M. Cernik, S. Waclawek, J. Nosek, J. Hrabal, and D. Bartosova.* Miroslav Cernik (Technical University of Liberec/Czech Republic)	**B7. Emerging Contaminants: Chromium** **Geochemistry of Chromium: Mechanisms for Natural Attenuation and In Situ Treatment.** *B.K. Schroth.* Brian K. Schroth (CH2M HILL/USA)	**Estimate and Evaluation of Biodegradation Rates in Biosparging, Air Sparging, and Oxygen Sparging.** *M. Morales, J. Leu, J. Lin, and S. Ferris.* Michelle Morales (Parsons/USA)
1:50	**A Treatment Train Approach to a DNAPL-Site Remediation Project.** *E. Meyers, G. Sattler, N. Scroggins, and J. Perdacaris.* Ed Meyers (UCPM Environmental/USA)	**Reduction of Cr(VI) in Mine Effluents Using Ascorbic Acid.** *Y. Govender-Ragubeer, E. Mangke, and M. Gericke.* Yageshni Govender-Ragubeer (Mintek/South Africa)	**Major Natural and Technological Factors Affecting Efficiency of Bioremediation of Jet Fuel in Sedimentary Bedrock.** *J. Machackova, S. Proksova, and F. Hercik.* Jirina Machackova (Technical University Liberec/Czech Republic)
2:15	**Update: Successful In Situ Bioremediation Following In Situ Chemical Oxidation for PCE Remediation.** *R.J. Hirsch.* Michael Sieczkowski (JRW Bioremediation, LLC/USA)	**Nanobiotechnology for In Situ Remediation of Hexavalent Chromium in Groundwater.** *J. Nemecek, L. Lacinova, M. Cernik, O. Lhotsky, and T. Cajthaml.* Jan Nemecek (Technical University of Liberec/ Czech Republic)	**LNAPL Removal by Bioventing.** *J.S. Spirito, A.I. Flori, and K. Kinsella.* John Spirito (GZA GeoEnvironmental, Inc./USA)
2:40	**Integrating Sustainable In Situ Thermal and Biological Treatment.** *J. Baldock, A.O. Thomas, S. Tillotson, and J. Dablow.* James Baldock (ERM/United Kingdom)	**In Situ Bioprecipitation of High-Concentration Cr(VI) in Groundwater Related to Chromate Ore Processing Residue.** *J. Horst, P. Jin, F. Natitus, R. Royer, M. Schrobrich, and M. Terril.* John F. Horst (ARCADIS/USA)	**BREAK**
3:05	**Implementation of Year-Five Follow-Up Injections at a Large-Scale CVOC Bioremediation and Thermal Remediation Project.** *M.A. Panciera, T. Kalinowski, L.A. Hellerich, and R. Henderson.* Matthew A. Panciera (AECOM/USA)	**Full-Scale Treatment of Hexavalent Chromium in Shallow Aquifer Using Emulsified Vegetable Oil.** *B.S. Langan and M.L. Adkins.* Bonani Langan (Amec Foster Wheeler/USA)	**C7.** **State of the Practice: Remediation of Crude Oil Impacted Soils.** *T.P. Hoelen.* Thomas P. Hoelen (Chevron/USA)

D Sessions Brickell	E Sessions Orchid	F Sessions Jasmine	
	E5. Incorporating **Sustainable Remediation and Its Influence on "Next Generation" LNAPL Recovery and Management.** *D.S. Woodward, B. Harding, and M. Zenker.* David S. Woodward (AECOM/USA)		**11:45**
LUNCH		**LUNCH**	**12:10**
D5. Compound-Specific Isotope Analysis **Isotope Fractionation Caused by VOC Water-Phase Diffusion during Air-Sparging Treatment—Implications to Biodegradation Assessment.** *D. Bouchard, D. Hunkeler, M. Marchesi, R. Aravena, T. Buscheck, E. Daniels, and R. Kolhatkar.* Daniel Bouchard (University of Neuchatel/ Switzerland)	**LUNCH**	**F7. Biodegradation in Complex Geological Sites** **Enhanced In Situ Bioremediation of Commingled 1,1,1-TCA and Chlorinated Ethenes in Overburden and Fractured Bedrock during Site Redevelopment.** *L.A. Hellerich, T. Abdul-Matin, K. Ryan, and C. Shuman.* Lucas A. Hellerich (AECOM/USA)	**12:35**
D5. Compound-Specific Isotope Analysis **Use of ^{13}C and ^{37}Cl Stable Isotopes to Estimate TCE Biodegradation Rates.** *R.L. Boone and E. Kolodziej.* Richard L. Boone (O'Brien & Gere/USA)	**E6. Sustainable Remediation Assessment Tools** **Advancing the Sustainability Evaluation Process for Remedial Activities.** *M.A. Harclerode, M.E. Miller, and P. Lal.* Melissa A. Harclerode (CDM Smith/USA)	**F7. Biodegradation in Complex Geological Sites** **Experimental Design for Assessment of Electrokinetically Enhanced Delivery of Lactate and Bacteria in 1,2-cis-dichloroethylene-Contaminated Limestone.** *B.H. Hansen, L.W. Nedergaard, L.M. Ottosen, M.M. Broholm, and C. Riis.* Bente Hoejlund Hansen (COWI/Denmark)	**1:00**
D5. Compound-Specific Isotope Analysis **CSIA Confirms Anaerobic Biodegradation of Bis(2-chloroethyl)ether (BCEE) Capable of in Groundwater at an Active Chemical Facility.** *D. Segal, R. Kolhatkar, and T. Kuder.* Daniel Segal (Chevron/USA)	**E6. Sustainable Remediation Assessment Tools** **Life Cycle Assessment, Footprint Analysis, Decision Analysis, and Best Management Practices: A Utilization Roadmap.** *P. Favara.* Paul J. Favara (CH2M HILL/USA)	**F7. Biodegradation in Complex Geological Sites** **A Case Study on Remediation of Chlorinated Ethenes via ISCR at a Redevelopment Site.** *F. Lakhwala, R. Harwood, E. Mertz, M. Meriney, and L. Dodge.* Fayaz Lakhwala (PeroxyChem, LLC/USA)	**1:25**
D5. Compound-Specific Isotope Analysis **Application of CSIA at Chlorinated Solvent Sites.** *P.B. Bennett, M-Y. Chu, and M. Einarson.* Peter Bennett (Haley & Aldrich/USA)	**E6. Sustainable Remediation Assessment Tools** **Green and Sustainable Sediment Remediation and Evaluating Sediment Sites Using SiteWise™ Version 3.1.** *S. Moore, A. Bullard, R. Sirabian, R. Wensink, and A. Hawkins.* Sam Moore (Battelle/USA)	**F7. Biodegradation in Complex Geological Sites** **Direct Introduction of Abiotic and Reductive Dechlorination Remediation Reagents Utilizing Soil Mixing in a Challenging Lithology.** *R. Wilson, S. Wisher, and E. Cooper.* Scott A. Wisher (Vironex Technical Services/ USA)	**1:50**
D5. Compound-Specific Isotope Analysis **Use of Multi-Isotope Tracers to Evaluate Biodegradation of Petroleum Hydrocarbons Enhanced by Sulfate Application.** *M. Marchesi, Y. Wei, R. Aravena, J.F. Barker, N.R. Thomson, D. Hunkeler, D. Bouchard, E. Madsen, T. Buscheck, E. Daniels, D. Segal, and R. Kolhatkar.* Ramon Aravena (University of Waterloo/Canada)	**E6. Sustainable Remediation Assessment Tools** **Source Characterization and Green Remediation at Petroleum-Impacted Sites.** *J. Lu and A. McNally.* Jun Lu (AECOM/USA)	**BREAK**	**2:15**
BREAK	**E6. Sustainable Remediation Assessment Tools** **Quantifying the Full (Remediation + Spilled Hydrocarbons) Greenhouse Gas Emissions for Petroleum Release Sites.** *B. McAlexander and K. Tuggle.* Ben McAlexander (Trihydro Corporation/USA)	**F8. Managing Large and Dilute Plumes** **State of the Practice in Managing and Treating Large Dilute Plumes.** *T.W. Macbeth and M.F. DeFlaun.* Tamzen Macbeth (CDM Smith/USA)	**2:40**
D6. **State of the Practice: Molecular Biological Tools, Leaps Forward and Lessons Learned.** *D.M. Ogles, A.E. Biernacki, and B.R. Baldwin.* Dora Ogles (Microbial Insights, Inc./USA)	**BREAK**	**F8. Managing Large and Dilute Plumes** **Microbiological and Molecular Tools to Understand Bacterial Function in Aquifer Sediments in a Multicontaminant Plume at Hanford.** *B.D. Lee, E.A. Cordova, J.T. Ellis, S.D. Saurey, D.L. Saunders, and M.H. Lee.* Brady D. Lee (Pacific Northwest National Laboratory/USA)	**3:05**

WEDNESDAY LATE AFTERNOON

	A Sessions Tuttle	B Sessions Monroe	C Sessions Flagler
3:30	**BREAK**	**BREAK**	**Use of Ligninolytic Enzymes in Encapsulated Formulation for Degradation of Heavily Weathered Crude Oil-Contaminated Soils.** *K.H. Kucharzyk, R. Darlington, R. Lalgudi, and D. Stoeckel.* Kate Kucharzyk (Battelle/USA)
3:55	**A8. Combined Remedies for Other Contaminants** **Combined Remedy Synergies: Examples and Conceptual Road Map.** *J. Birnstingl.* Jeremy Birnstingl (Regenesis/United Kingdom)	**B8. Emerging Contaminants: Other Metals** **Optimization of Metals Bioremediation Using Column and Microcosm Studies.** *J. Roberts, P. Dennis, S. Dworatzek, P. Dollar, and A. Przepiora.* Sandra Dworatzek (SiREM/Canada)	**C7. Remediation of Heavy Hydrocarbon-Contaminated Soils** **Methanogenic Degradation of Branched Hydrocarbons (Iso-alkanes) in Oil Sands Tailings.** *T. Siddique, K. Semple, and J.M. Foght.* Tariq Siddique (University of Alberta/Canada)
4:20	**Combined Remedy Benefits of Integrated Physical, Chemical and Biological Treatments on a 14-Million-Liter Fuel Spill in a Swedish Forest.** *K. Forsberg, J. Bergman, G. Leonard, and J. Birnstingl.* Jonny Bergman (RGS 90 Sverige AB/Sweden)	**Zinc Complexation by Chitosan and the Effects on Aquatic Biota.** *R.C. Corrêa, G.R. Gorni, S.P. Campana-Filho, R.M.G. Souto, and J.J. Corbi.* Juliano José Corbi (Universidade de São Paulo/ Brazil)	**In Situ Extracellular Electron Transfer in Tar Oil-Contaminated Aquifers: Elucidating the Role of Mn(IV) as Terminal Sink for Electrons from Anaerobic PAH Oxidation.** *K.E. Scherr, A. de Schaetzen, M. Sumetzberger-Hasinger, D. Backes, and M. Nahold.* Kerstin E. Scherr (University of Natural Resources and Life Sciences/Austria)
4:45	**In Situ Treatment Train (ISCO, Aerobic and Anaerobic Bioremediation) to Address an LNAPL Source Area.** *K.A. Morris.* Kevin A. Morris (ERM/USA)	**Arsenic in Groundwater at Geochemical Extremes: Acidic and Reducing Conditions May Confound Analysis.** *J. Gillow, M. Hay, R. Murphy, and B. Anckner.* Jeff Gillow (ARCADIS U.S., Inc./USA)	**Pyrolytic Remediation of Soil Contaminated with Heavy Hydrocarbons.** *J. Vidonish, P. Zhao, K. Zygourakis, C.A. Masiello, J. Mathieu, and P.J.J. Alvarez.* Julia Vidonish (Rice University/USA)
5:10	**Comparison of In Situ Enhanced Bioremediation/Chemical Reduction and Chemical Oxidation of Mixed Metals and TCE.** *C. Northington and P. Hicks.* Chad Northington (WRS Infrastructure & Environment, Inc./USA)	**Biotransformation Pathways of Dimethylarsinic (Cacodylic) Acid in the Environment.** *J. McKernan, K. Scheckel, H. Rectanus, B. Yates, R. Fimmen, and J. Lenhart.* Heather V. Rectanus (Battelle/USA)	**Enhancement of Bioremediation of Soils Contaminated with Organic Hydrocarbons Using an Electron Beam.** *K. Briggs, D. Staack, T. Hoelen, and D. Kong.* David Staack (Texas A&M University/USA)

POSTER GROUP 2: SCHEDULE

Display: Wednesday 7:00 a.m.–Thursday 1:00 p.m.
Presentations: Wednesday 5:45–7:00 p.m.

The sessions in this group are listed on page 25, and the poster presentations are listed on pages 26-29.

During the presentation period, presenters will be available at their posters to discuss their work. A light reception will be served in the poster area during the presentations.

D Sessions Brickell		E Sessions Orchid		F Sessions Jasmine	
D6. Molecular Biological Tools	**The Molecular Tool Box: Current and Future Applications to Improve Microbial Remedies.** *B. Simsir, K. Chourey, R. Hettich, K. Ritalahti, and F. Loeffler.* Frank E. Loeffler (University of Tennessee Knoxville/USA)	E7. International Perspective on GSR	**Green and Sustainable Remediation in Practice: International Perspectives and Local Contexts.** *D. Hou.* Deyi Hou (Parsons Corporation/USA)	F8. Managing Large and Dilute Plumes	**Biosensors for Predicting and Monitoring Environmental Perturbations and Microbial Response across a Uranium Nitrate-Contaminated Watershed.** *A.M. Rocha, J.H. Campbell, T. Mehlhorn, K. Lowe, J. Earles, J. Phillips, S. Brooks, D.B. Watson, M.B. Smith...* Andrea Rocha (Oak Ridge National Laboratory/USA)	**3:30**
	Using CSIA to Document Biodegradation of *cis*-DCE and Vinyl Chloride in Groundwater. *T.H. Wiedemeier, M.J. Pound, and J.T. Wilson.* John T. Wilson (Scissortail Environmental Solutions, LLC./USA)		**Green and Sustainable Remediation Development in Taiwan: Framework, Tools, and Case Studies.** *C.S.Chen, K.H. Yang, H.C. Hung, B.N. Wang,T.W. Chiang and X.X. You.* Yueh-Hsien Lin (SINOTECH Environmental Technology Ltd./Taiwan)		**Treatment of Contaminants in Low-Permeability Zones.** *K. Saller and T. Sale.* Kevin Saller (CDM Smith/USA)	**3:55**
	Metagenomic and Metagenetic Approaches Applied to Enhanced Anaerobic Reductive Dechlorination of Polychlorinated Biphenyls: Linking Structure and Function. *S. Cecillon and T.M. Vogel.* Sebastien Cecillon (Ecole Centrale de Lyon/France)		**Sustainable Remediation: Which Approach Shall I Use?** *A. Careghini, A. Mastorgio, A. Sala, S. Saponaro, and E. Sezenna.* Andrea Mastorgio (Politecnico di Milano—DICA/Italy)		**Long-Term Bioremediation and Management for a Commingled Chlorinated Solvent and 1,4-Dioxane Source Area and Plume.** *R.A. Wymore, T. Kuehster, G. Stanley, J. Kurtz, and D. Folkes.* Ryan A. Wymore (Geosyntec/USA)	**4:20**
	Use of Metaproteomics for Detection of Peptides Involved in In Situ Degradation of Energetic Contaminants. *K.H. Kucharzyk, C. Bartling, L. Mullins, W. Condit, and H. Rectanus.* Kate Kucharzyk (Battelle/USA)		**GoldSET© CN: A Project Life Cycle Approach to Operationalizing Sustainability in the Field of Contaminated Site Remediation.** *S. Karnis and F. Beaudoin.* Francois Beaudoin (Golder Associates/Canada)		**Bioremediation of a Large Chlorinated Solvent Plume, Dover AFB, Delaware.** *A. Bloom, R. Lyon, L. Stenberg, and H.A. Brown.* Robert Lyon (AECOM/USA)	**4:45**
	Understanding Technetium Immobilization in the Subsurface at the Hanford Site. *D.L. Saunders, B.D. Lee, J.T. Ellis, S.D. Saurey, E.A. Cordova, and M.H. Lee.* M. Hope Lee (Pacific Northwest National Laboratory/USA)		**International Perspectives on GSR: State of the Practice, Challenges and Opportunities.** *B. Maco and A. McNally.* Barbara Maco (Wactor & Wick LLP/USA)		**Hydrogeologic Limitations to In Situ Remediation of a Dilute VOC and 1,4-Dioxane Plume in the North Carolina Piedmont.** *T.K. Kafka and B.K. Amos.* Todd Kafka (Geosyntec Consultants/USA)	**5:10**

POSTER GROUP 2: SESSION TITLES

A7. Combined Remedies for VOCs
A8. Combined Remedies for Other Contaminants
A9. Successes and Failures of Bioaugmentation and Biostimulation
A10. Cometabolic Bioremediation
B7. Emerging Contaminants: Chromium
B8. Emerging Contaminants: Other Metals
B9. Emerging Contaminants: Perfluorinated Compounds
B10. Emerging Contaminants: 1,4–dioxane
B11. Other Emerging Contaminants
C7. Remediation of Heavy Hydrocarbon-Contaminated Soils
C8. Bioremediation in Marshes and Deep-Sea Environments
C9. Biodegradation and Remediation of Crude Oil in Cold Regions
C10. *(no posters)*
D4. Fate and Transport of Biofuels
D5. Compound-Specific Isotope Analysis
D6. Molecular Biological Tools
D7. Advances in Monitoring and Optimization Techniques
D8. *(no posters)*
D9. High-Resolution Site Characterization
E4. Best Practices in GSR
E5. Incorporating GSR into Remedy
E6. Sustainable Remediation Assessment Tools
E7. *(no posters)*
E8. *(no posters)*
E9. Bioremediation in Latin America
E10. Case Studies and Lessons Learned Applying Bioremediation Internationally
F6. Biodegradation in Fractured Bedrock Sites
F7. Biodegradation in Complex Geological Sites
F8. Managing Large and Dilute Plumes
F9. Bioremediation of Deep Contamination
F10. Bioremediation of Sediments
F11. Climate Considerations Associated with Bioremediation

POSTER GROUP 2: PRESENTATIONS

A7. Combined Remedies for VOCs

1. Combining In Situ Chemical Reduction and Phytoremediation as an Expedited Closure Strategy in a Low-pH/Elevated-Sulfate Pinelands Aquifer at a Long-Term New Jersey Superfund Site. *T.J. Patterson, R.S. Srirangam, T. Schott, and L.M. Brausch.*
Thomas J. Patterson (Roux Associates, Inc./USA)

2. Synergy of Trap & Treat BOS® 100® and 3DMe Tackles Large TCE Plume. *M. Mazzarese, G. Simpson, S. Noland, and G. Wise.*
Scott Noland (Remediation Products, Inc./USA)

3. Utilization of Remediation Performance Indicators to Select mZVI Powders for Inclusion in an Enhanced In Situ Bioremediation Remedy. *S.D. Dingman, B.W. Diepeveen, D.W. Elliott, C.J. Voci, W.D. Brady, and J. Roberts.*
Sean Dingman (BASF NA/USA)

A8. Combined Remedies for Other Contaminants

4. Screening Nonionic Surfactants for Enhanced Biodegradation of Polycyclic Aromatic Hydrocarbons in Contaminated Soil. *A.C. Adrion, J. Nakamura, and M.D. Aitken.*
Alden Adrion (University of North Carolina at Chapel Hill/USA)

5. A Natural Approach to the Remediation of a Recalcitrant BTEX Plume. *M. Edelman, M. Eberle, M. Hart, and D. Carlson.*
Michael Edelman (TRC Environmental Corporation/USA)

A9. Successes and Failures of Bioaugmentation and Biostimulation

6. Performance Evaluation of a Source Area Remedial Approach Utilizing Multiple Degradation Pathways to Remediate Commingled 1,1,1-TCA and TCE. *L.A. Hellerich, P.H. Gratton, and P.M. Dombrowski.*
Lucas A. Hellerich (AECOM/USA)

7. Passive Bioremediation of Commingled Perchlorate, RDX, and HMX at an Active Military Range. *M.E. Fuller, P.B. Hatzinger, P.C. Hedman, and C.W. Condee.*
Mark E. Fuller (CB&I Federal Services/USA)

8. Impact of In Situ Remediation on Groundwater Chemistry at Petroleum Sites in Florida. *L.S. Bienkowski.*
Lee Bienkowski (Ellis & Associates/USA)

9. Investigating the Effectiveness of Soil Column versus Soil Slurry Respirometry. *N. Hathaway and J.C. Young.*
Nathan J. Hathaway (Environmental Business Specialists, LLC/USA)

10. Success of EHC and ABC Substrates to Treat Chlorinated VOCs: 170-Day Bench-Scale Study. *H. Benfield and S. Sadrpour.*
Heather E. Benfield (Tetra Tech, Inc./USA)

11. There's More Than One Way to Bioaugment That Aquifer! *C.H. Bell and R.C. Oesterreich.*
Caitlin H. Bell (ARCADIS/USA)

12. Multiple Carbon Source Types and Distribution Methods for the Reduction of Chlorinated Ethenes. *P. Srivastav, S. Watson, S. Suryanarayanan, K. Everett, and A. Wilmore.*
Robert E. Mayer (CB&I Federal Services/USA)

13. Coupled Reduction/Oxidation Approach to Treat Chlorinated Solvents in an Aquifer Influenced by Regional Irrigation. *J. Kiernan, J. Shira, and T. Fowler.*
Troy Fowler (BIOS, Inc./USA)

A10. Cometabolic Bioremediation

14. Optimizing Gas Delivery System for Cometabolic Bioremediation of 1,4-Dioxane. *D. Ray, G. Birk, and D.F. Alden.*
David Alden (Tersus Enviromental/USA)

15. Evaluation of Cometabolic Biodegradation Potential for 1,4-Dioxane. *P.B. Hatzinger, R.J. Steffan, P. Koster van Groos, and S. Streger.*
Paul B. Hatzinger (CB&I Federal Services/USA)

B7. Emerging Contaminants: Chromium

16. Overcoming Challenges Caused by Previous Remedial Actions to Remediate a Chromium and TCE Contaminant Plume. *J.R. Woertz, S.E. Fain, and J.C. Wolfe.*
Jennifer R. Woertz (AECOM/USA)

17. Use of Stable Chromium Isotopes to Assist in Distinguishing Anthropogenic and Natural Sources in Groundwater. *B.K. Schroth, J.A. Izbicki, P. Martin, and T.D. Bullen.*
Brian K. Schroth (CH2M HILL/USA)

18. Pinning Down Site-Specific Sorption (Kd) of Hexavalent Chromium: Evaluation of Desk-Top, Bench-Top, and Field Investigations. *T. Kalinowski, Z. Smith, and L.A. Hellerich.*
Tomasz Kalinowski (AECOM/USA)

19. Methane Prevention during Bioremediation of Chromium (VI) in Fractured Bedrock. *L. Zeng, S. Abrams, K. Tyson, and J. Mueller.*
Stewart H. Abrams (Langan Engineering and Environmental Service, Inc./USA)

B8. Emerging Contaminants: Other Metals

20. Antimethanogenic ISCR Reagent for Improved Heavy Metal Immobilization. *B. Rehm, J. Peterson, and J. Mueller.*
Jim Mueller (Provectus Environmental Products/USA)

21. Groundwater Arsenic Contamination in Raghunathganj Area of Murshidabad District, India: Causes, Effects and Remediation. *P. Mukherjee, S. Rajput, S. Rani, S. Chatterjee, and I. Chandra.*
Piyali Mukherjee (Burdwan University/India)

B9. Emerging Contaminants: Perfluorinated Compounds

22. Emerging Contaminant False Positives from Standard Groundwater Sampling Equipment and Procedures. *W.H. DiGuiseppi, D.M. Winter, J.W. Hatton, J.A. Field, K.A. Barzen-Hanson, J.J. Bishop, and D.R. Berggren.*
William H. DiGuiseppi (CH2M HILL/USA)

23. Field-Deployable PFC Sensors for Contaminated Site Screening. *L.D. Chen, C.-Z. Lai, J. Thompson, and P. Buhlmann.*
Jon Thompson (United Science/USA)

B10. Emerging Contaminants: 1,4–dioxane

24. Sustainable Phytoremediation of 1,4-Dioxane: 10 Years of Success. *B. Dahlgren.*
Bryon Dahlgren (AECOM/USA)

25. Bench-Scale Testing of Various AOPs for Removal of 1,4-Dioxane versus Bioremediation and MNA. *S. Kumar.*
Shiva Kumar (Tetra Tech/USA)

26. In Situ Thermal Remediation of 1,4-Dioxane and Advances in Heat-Enhanced Bioremediation. *D. Oberle and E. Crownover.*
David Fleming (TRS Group, Inc./USA)

27. Using Aerobic Cometabolic 1,4-Dioxane Biodegradation and Groundwater Recirculation to Treat 1,4-Dioxane and Co-Contaminants in a Dilute Plume. *M.-Y.J. Chu, P. Bennett, A. Peacock, M. Dolan, M. Hyman, R.A. Anderson, and A. Bodour.*
Min-Ying Jacob Chu (Haley & Aldrich, Inc./USA)

28. Microbially Driven Fenton Reaction for Simultaneous Degradation of 1,4-Dioxane and Co-Located Contaminants Tetrachloroethylene (PCE) and Trichloroethylene (TCE). *R. Sekar and T. DiChristina.*
Ramanan Sekar (Georgia Institute of Technology/USA)

29. Bench-Scale Assessment of Monitored Natural Attenuation and Bioremedial Treatment Alternatives for 1,4-Dioxane at a Contaminated Site. *M. Li, J.W. Hatton, Y. Liu, W.H. Diguiseppi, and P. Alvarez.*
William H. DiGuiseppi (CH2M HILL/USA)

30. Effect of Hexavalent Chromium on the Biodegradation of 1,4-Dioxane. *S. Mahendra, R. Mora, D. Chiang, P. Gedalanga, S. Zhang, T. Phan, and B. Gu.*
Rebecca Mora (AECOM/USA)

B11. Other Emerging Contaminants

31. Laboratory Treatability Study to Assess the Aerobic Biodegradation Process for Propylene. *M. Kozar, E. Schleicher, B. Bakrania, and C. Schreier.*
Michael Kozar (O'Brien & Gere/USA)

C7. Remediation of Heavy Hydrocarbon-Contaminated Soils

32. Thermal Treatment for Solubilization and Biodegradation of Weathered Heavy Hydrocarbon-Contaminated Soils. *J.M. Kidd, I.C. Ruiz, R.U. Halden, P.K. Mondal, B.E. Sleep, and S. Fenton.*
Pulin K. Mondal (University of Toronto/Canada)

33. Thermally Enhanced Solubilization and Oxidation of Weathered Heavy Hydrocarbons in Soil. *P.K. Mondal, A. Paulraj, B.E. Sleep, S. Fenton, T.P. Hoelen, J.M. Kidd, and R.U. Halden.*
Pulin K. Mondal (University of Toronto/Canada)

34. Efficacy of Pyrolyzed Biomass as a Sustainable Remediation Strategy for Heavy Hydrocarbon-Contaminated Shallow Soils. *F.N.D. Mukome, J. Shang, J. Peng, M.C. Buelow, R. Schmidt, X. Gao, C.A. Masiello, J.J. Pignatello, T.P. Hoelen, S.J. Parikh, N. Sihota, and D.M. Mackay.*
Fungai N.D. Mukome (University of California, Davis/USA)

35. Advanced Oxidative Pretreatment of Heavy Hydrocarbon-Contaminated Soil to Enhance TPH Removal and Bioremediation. *J. Wang, Z. Chen, A.P.S. Lima, P. Zhao, and P.J.J. Alvarez.*
Yu Yang (Rice University/USA)

36. Enzymatic Pretreatment of Heavy Hydrocarbon-Contaminated Soil for Enhanced Bioremediation. *J. Mathieu and P. Alvarez.*
Yu Yang (Rice University/USA)

37. Evaluation of a Novel Extractant for Remediation of Heavy Hydrocarbon-Impacted Soils. *N.M. Wilton, B.A. Lyon, K.D. Pennell, A. Robbat, R. Kamath, and T. Hoelen.*
Bonnie A. Lyon (Tufts University/USA)

C8. Bioremediation in Marshes and Deep-Sea Environments

38. Anaerobic-Aerobic Method of Bioremediation of a Fenny Bog with Old Oil Pollution in Western Siberia: A Pilot-Scale Test. *S. Gaydamaka, V. Murygina, M. Gladchenko, and A. Zubaydullin.*
Sergey Gaydamaka (Lomonosov Moscow State University/Russian Federation)

39. Washover Tidal Events as a Source of Oil Persistence on Coastal Headland Beaches. *M. Rodrigue, V. Elango, and J.H. Pardue.*
John H. Pardue (Louisiana State University/USA)

40. Bioremediation of Deepwater Horizon Crude Oil in Louisiana Salt Marshes Amended with Clay Minerals. *D. Deocampo and J. Ghelerter.*
Jill Ghelerter (Amec Foster Wheeler Environment & Infrastructure/USA)

C9. Biodegradation and Remediation of Crude Oil in Cold Regions

41. Development of the Method for Softening of an Asphalt-Like Crust on a Surface of a Bog with Old Oil Pollution. *S. Gaydamaka, V. Murygina, M. Gladchenko, and A. Likholitova.*
Sergey Gaydamaka (Lomonosov Moscow State University/Russian Federation)

42. The Role of Organic Acids in Increasing Phosphate Availability for Hydrocarbon Remediation in Cold Soils. *C. Phillips, J. Hamilton, S. Siciliano, and D. Peak.*
Courtney L. Phillips (University of Saskatchewan/Canada)

43. Speciation and Movement of a Polyphosphate Amendment: The Remediation of a Hydrocarbon-Contaminated Cold Soil Aquifer. *J.G. Hamilton, S.D. Siciliano, and D. Peak.*
Jordan Hamilton (University of Saskatchewan/Canada)

44. Phosphate Reactive Transport in Hydrocarbon-Contaminated Cold Soils. *D.R. Bulmer, S.D. Siciliano, B.C. Si, and D. Peak.*
David R Bulmer (University of Saskatchewan/Canada)

45. Geochemical Approaches to Enhance Phosphorous Availability and Stimulate Hydrocarbon Degradation in Cold Soils. *D. Peak, S.D. Siciliano, C.L. Phillips, J. Hamilton, D. Bulmer, D. Hilger, J. Grosskleg, and T. Carlson.*
Derek Peak (University of Saskatchewan/Canada)

46. Evaluating Biochar Amendments and Phosphate Polymers for In Situ Hydrocarbon Remediation in Cold Soils. *T. Carlson, J. Grosskleg, J.G. Hamilton, D. Peak, and S.D. Siciliano.*
Trevor Carlson (Federated Co-operative Ltd./Canada)

D4. Fate and Transport of Biofuels

47. Methanogenic Biodegradation of Different Types of Biodiesel: Impacts on Benzene Biodegradation and Microbial Communities. *A.S. Danko, F. Portugal, M. Rosas, T. Oliva-Teles, H. Ribeiro, A.P. Muncha, C. Magalhaes, and J.M. Dias.*
Anthony S. Danko (University of Porto/Portugal)

48. Municipal Wastewater Treatment and Biofuel Production: Effects of Selected Pharmaceuticals on Lipid Productivity and Transcriptomic Responses of Microalga *Chlorella vulgaris*. *S. Ranjbar and B. Van Aken.*
Sibia Ranjbar (Temple University/USA)

D5. Compound-Specific Isotope Analysis

49. Interpreting Field Data Based on Trends from a One-Dimensional Model of Contaminant Isotopic Ratios Subject to Degradation and Advective Flow. *P.W. McLoughlin, R.J. Pirkle, and A.D. Peacock.*
Pat McLoughlin (Pace Analytical Energy Services/USA)

50. Isotopic Fractionation in the Terminal Electron Acceptors during Biodegradation of Benzene and Toluene. *L. Stehmeier, C. Jackson, and B. Mayer.*
Les Stehmeier (NOVA Chemicals/Canada)

51. Extending the Applicability of Compound-Specific Isotope Analysis to Low Concentrations of 1,4-Dioxane. *P. Bennett, R. Aravena, M. Nickelsen, A. Peacock, J. Chu, and M. Einarson.*
Peter Bennett (Haley & Aldrich/USA)

D6. Molecular Biological Tools

52. Novel Genera Identified as Vinyl Chloride-Assimilating Microorganisms Using Stable Isotope Probing. *F. Paes, A. Cupples, X. Liu, and T. Mattes.*
Fernanda Paes (Michigan State University/USA)

53. Development of Loop-Mediated Isothermal Amplification (LAMP) for Rapid Detection of *Dehalococcoides* spp. in Groundwater Samples. *Y.H. Kanitkar, R.D. Stedtfeld, S.A. Hashsham, R.J. Steffan, and A.M. Cupples.*
Yogendra Kanitkar (Michigan State University/USA)

54. Advancing Phosphorous Speciation with Improved Mineral Libraries for X-Ray Absorption Spectroscopy. *D.M. Hilger and J.D. Peak.*
David Hilger (University of Saskatchewan/Canada)

55. Diversity and Activity of Organohalide-Respiring Bacteria in PCB-Contaminated Activated Sludge and Toxicity of Digested Biosolids. *F. Akbari, M. Horwat, C. Draghi, N. Andrade, and B.V. Kjellerup.*
Birthe V. Kjellerup (University of Maryland at College Park/USA)

56. Microbial Community Characterization at Bioremediation Sites Using Next Generation Sequencing. *K. Krivushin, L. Lomheim, E. Edwards, P. Dennis, X. Druar, S. Dworatzek, and P. Dollar.*
Kirill Krivushin (University of Toronto/Canada)

57. Microbial Characterization of Soil Using Molecular Methods and Traditional Culturing for Assessment of Natural Attenuation of Mixed Contaminants. *K.W. Croyle, Y.M. Nelson, A. Hamrick, C. Kitts, K.L. Roberts, T. Lane, K. Poorey, D. Curtis, and K. Williams.*
Kenny W. Croyle (California Polytechnic University, San Luis Obispo/USA)

POSTER GROUP 2: PRESENTATIONS

D7. Advances in Monitoring and Optimization Techniques

58. A Review of the Basis for Environmental Sample Holding Times and an Experimental Evaluation of Alternative Stabilization Techniques for Polycyclic Aromatic Hydrocarbons. *D. Kong, W. Gala, G. Wolinsky, R. Arnold, G. Douglas, and J. Hardenstine.*
Deyuan Kong (Chevron/USA)

59. Enhancing Data Quality, Validity, and Reporting Speed with a Mobile Solutions Tool. *M.S. Raybuck.*
Mark S. Raybuck (Parsons/USA)

60. Innovative Sampling Technique for Site Characterization at an Active Manufacturing Facility. *L. Sweet, M. Capodivacca, and M. Noel.*
Lesa A. Sweet (Tetra Tech/USA)

61. SERDP Study Explores Well-Flow Dynamics for Active and Passive Sampling. *S.L. Britt.*
Sanford Britt (ProHydro, Inc./USA)

62. Using Predictive Uncertainty Analysis to Optimize an In Situ Bioremediation System Design and Control: Field-Scale Application. *E. Verardo, O. Atteia, L. Rouvreau, and J.C. Gourry.*
Elicia Verardo (University of Bordeaux/France)

63. The Death of the Myth of Long-Screened Wells! A Unique Methodology to Assess Large Dilute Plumes. *N. Heller, R. Cramer, and W. Neal.*
Noah Heller (BESST, Inc./USA)

64. 3-D Mapping of Subsurface Microbial Activity for Complete CSM. *M. Kluger, T. Halihan, and S. McDonald.*
Mark Kluger (Dajak, LLC/USA)

65. Development of an Innovative Approach for Characterizing Nonaqueous-Phase Liquid (NAPL) in a Heterogeneous Subsurface Environment. *A. Barton, A. Bullard, J. Hawkins, H. Rectanus, N. Voorhies, and B. Jackson.*
Jared B. Hawkins (Battelle/USA)

D9. High-Resolution Site Characterization

66. High-Resolution Site Characterization Using Conventional Technologies to Delineate and Improve the Conceptual Site Model of a TCE Groundwater Plume. *J. Van Bogaert.*
Joshua Van Bogaert (U.S. Army Corps of Engineers/USA)

67. High-Resolution Site Characterization and Advanced 2-D/3-D Conceptual Site Model Development for Evaluating Post-Bioremediation Conditions. *J.C. Ruf, J.A. Orris, and K. Sorensen.*
Jason C. Ruf (S2C2 Inc./USA)

68. High-Resolution Characterization for Determination of ERD of Chlorinated Solvents in Clay Till. *M.M. Broholm, I. Damgaard, J. Chambon, P.J. Binning, P.L. Bjerg, D. Hunkeler, S. Jeannottat, J. Bælum, and C.S. Jacobsen.*
Mette M. Broholm (Technical University of Denmark/Denmark)

E4. Best Practices in GSR

69. SVE Success: Sustainable Goals and Performance from Design to Completion. *H.F. Nichols, N. Rabah, B. Parekh, and S. Jagupilla.*
Bhuvnesh Parekh (TRC Envrionmental Corp./USA)

70. Making Thermal Remediation More Sustainable: A Detailed Analysis. *S.G. Nielsen, R.S. Baker, G. Heron, and G. Lemming.*
Steffen Griepke Nielsen (TerraTherm/USA)

71. Best Management Practices: ISCO and ERD. *D.K. Nair, S. Rosansky, W. Condit, J. Fortenberry, N. Durant, and L. Smith.*
Sam Moore (Battelle/USA)

E5. Incorporating GSR into Remedy

72. Incorporating Sustainability Concepts into Effective Site Remediation Strategies. *T. Pac, E. Gyles, K.A. Morris, and P. Dugan.*
Timothy Pac (ERM/USA)

73. Sustainable Treatment Using C3™ Refrigerated Condensation. *G. Smith, N. Ryan, and S. Giliam.*
Noel Ryan (Huntsman Polyurethanes Pty Ltd/Australia)

74. Incorporating Sustainability Evaluation into a Feasibility Study for a 1,4-Dioxane-Contaminated Site in South Carolina. *T.W. Ovbey, M. Robinson, S. O'Connell, and D. Hou.*
Tracy W. Ovbey (Parsons Corporation/USA)

75. ISCO and Enhanced In Situ Biodegradation (EISB) of Dissolved Benzene Plume in a Fractured Rock Aquifer. *F. Abo.*
Fouad Abo (GHD Pty. Ltd./Australia)

E6. Sustainable Remediation Assessment Tools

76. Using Current GSR Tools to Evaluate Horizontal Remediation Wells in Site Remedy Selection. *D.W. Ombalski and M.D. Lubrecht.*
Dan Ombalski (Directed Technologies Drilling/USA)

77. How Life-Cycle Assessment Can Identify Environmental Burdens and Support Sustainable Decision Making. *P. Favara and T. Krieger.*
Paul J. Favara (CH2M HILL/USA)

78. Life-Cycle Assessment (LCA) for Green and Sustainable Remediation. *J.M. Sullivan, M. Metzger, L. Segroves, and S. Ramsden.*
Julie M. Sullivan (Barr Engineering Company/USA)

E9. Bioremediation in Latin America

79. Nanoparticles for the Treatment of Effluents and Groundwater Contaminated with Chlorinated Organic Compounds: An Overview. *L.M. Breton-Deval, H.M. Poggi-Varaldo, E. Rios-Leal, F. Godinez-Salomon, and O. Solorza-Feria.*
Luz Breton-Deval (Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional/Mexico)

E10. Case Studies and Lessons Learned Applying Bioremediation Internationally

80. Bioremediation of Hexavalent Chromium—A Few Significant Site Histories in Italy. *A. Careghini, A. Mastorgio, S. Saponaro, and E. Sezenna.*
Andrea Mastorgio (Politecnico di Milano-DICA/Italy)

F6. Biodegradation in Fractured Bedrock Sites

81. Edible Oil Injection Event Monitored Using Conductivity Transducers at a Fractured Bedrock Site. *K.W. Frysinger and G.L. Kirkpatrick.*
Kevin Frysinger (Environmental Standards/USA)

82. Overcoming Inhibition to Enhance Bioremediation in the Source Zone of a Fractured Bedrock Aquifer Impacted by Mixtures of Chlorinated Compounds. *B. Goodwin, Y. Chai, D. Wandor, P. van Riet, D. Ogles, A. Biernacki, B.R. Baldwin, J.T. Wilson, K. Sublette, M. Manefield, and M. Lee.*
Dora Ogles (Microbial Insights, Inc./USA)

83. Rapid Assessment of Remedial Effectiveness and Rebound in Fractured Bedrock. *G. Lavorgna, C.E. Schaefer, D.R Lippincott, and R.M. Towne.*
Charles E. Schaefer (CDM Smith/USA)

84. Optimization and Lessons Learned: Biorecirculation to Enhance Degradation of Trichloroethene/1,1,1 -Trichloroethane in Fractured Rock. *M.S. Kozar, C.A. Fogas, and S.Y. McQueen.*
Michael Kozar (O'Brien & Gere/USA)

85. No Further Action: A Case Study on HIgh-Resolution Site Characterization and Bioremediation in a Fractured Bedrock Setting. *N. Thacker and R. Boyle.*
Nathan Thacker (AST Environmental, Inc./USA)

86. Optimal Treatment Zone Moves during Enhanced Reductive Dechlorination in Fractured Bedrock. *R.W. Henterly and W.D. Harms.*
Richard W. Henterly (EHS Support LLC/USA)

87. Achieving MCLs in Fractured Bedrock: 1,2-Dichloroethane Source Treatment and Reduced Bedrock Flux. *M. Schnobrich, R. Royer, M. Gefell, D. Lipson, L. Hamilton, and A. Fisher.*
Matthew Schnobrich (ARCADIS U.S., Inc./USA)

F7. Biodegradation in Complex Geological Sites

88. Environmental Sequence Stratigraphy Applied to Complex Geologic Settings: Glacial Deposits. *C. Plank, R. Cramer, and M. Shultz.*
Michael R. Shultz (AECOM/USA)

89. Sulfate Reduction to Remediate a Site with Complex Geology. *L. Zeng, S. Abrams, A. Oka, S. Ciambruschini, Z. Pan, C.D. Ambrose, and M. Boufadel.*
Lingke Zeng (Langan Engineering & Environmental Service, Inc./USA)

F8. Managing Large and Dilute Plumes

90. Emulsified Oil Injection and Full-Scale Groundwater Remediation System Operation. *E. Tyler, L. Dalton, J. Galemore, and E. Nuttall.*
Edward Tyler (Kleinfelder, Inc./USA)

91. Enhanced In Situ Bioremediation Pilot Study for a Large and Dilute Chlorinated Solvent Plume. *P.L. Chang, H.V. Rectanus, D.W. Payne, A.M. Paolucci, and C.T. Zimmerman.*
Pamela L. Chang (Battelle/USA)

92. Enhanced Anaerobic Bioremediation with Neat Vegetable Oils for Long-Term Treatment of Chlorinated Solvent Sites. *J. Hesemann and P.J. Dugan.*
David Horne (Burns & McDonnell/USA)

93. In Situ Chemical Reduction with SRS-Z at Maxwell Air Force Base, Alabama. *M.D. Lee, R.L. Raymond, and M. Stapleton.*
Michael D. Lee (Terra Systems, Inc./USA)

94. Right-Sizing Your Remediation in a Performance-Based Remediation World. *M. MacEwan, A. Gupta, and S. Moore.*
Mark MacEwan (AECOM/USA)

95. Implementing Sustainable Biostimulation in Bedrock to Expedite Site Closure of a Large Dissolved-TCE Plume. *K.A. Morris.*
Kevin A. Morris (ERM/USA)

96. Establishing a Cost-Distribution Relationship: How to Optimize Injection Points versus Injection Volumes. *A.K. Kutty, J.A. England, K.J. Ruder, and R. Thompson.*
Arvind K. Kutty (Gilbane Company/USA)

F9. Bioremediation of Deep Contamination

97. In Situ Microcosm Evaluation of Biostimulation and Bioaugmentation for Chlorinated Ethenes in Groundwater. *L. LaPat-Polasko and C. Aziz.*
Laurie T. LaPat-Polasko (ENVIRON International/ USA)

98. Laboratory Evaluation of Biostimulation to Treat Chlorinated Ethenes in Fractured Sandstone. *R. Yu, D.L. Freedman, and R.G. Andrachek.*
Rong Yu (Clemson University/USA)

99. Enhanced Reductive Dechlorination of a TCE Bedrock Groundwater Plume, Northern New Jersey. *M. Edelman, M. Eberle, M. Hart, and D. Carlson.*
Michael Edelman (TRC Environmental Corporation/USA)

F10. Bioremediation of Sediments

100. Cryogenic Dewatering of Dredged Sediments in Confined Spaces. *L. Prieto-Portar.*
Luis Prieto-Portar (Priedroba Consulting Group/ USA)

101. Remediation of Dredged Marine Sediments Contaminated with PCBs by Separation and Washing Techniques. *J.Y. Choi, K.R. Kim, and G.H. Hong.*
Jin Young Choi (Korea Institute of Ocean Science and Technology/South Korea)

F11. Climate Considerations Associated with Bioremediation

102. Large-Diameter Nutrient Delivery Systems for Enhanced Hydrocarbon Remediation in Cold Soils. *J. Grosskleg, T. Carlson, S.D. Siciliano, B. Chartrand, R.D. Wilson, and D. Black.*
Jay Grosskleg (Federated Cooperatives Ltd./ Canada)

THURSDAY MORNING

	A Sessions Tuttle	B Sessions Monroe	C Sessions Flagler
8:00	**Substrate Delivery Strategies and Lessons Learned for In Situ Biostimulation/ Bioaugmentation Treatment of a Large Chlorinated Ethenes Groundwater Plume.** *M. Yurovsky, N. Hey, S. Anderson, and D. Janda.* Michael G. Yurovsky (CB&I Federal Services/ USA)	**A Case Study and Data Gap Analysis of Possible Biotransformation of Perfluoroalkyl Acids (PFAAs) Precursors.** *D.J. Corsi, D. Bogdan, and R. Delaney.* Dale J. Corsi (AECOM/USA)	**Biodegradation of High-Saline, High-Temperature Groundwater Impacted with Hydrocarbons.** *M. Kashir and R. McGregor.* Mansor Kashir (Saudi Aramco/Saudi Arabia)
8:25	**Enhanced In Situ Bioremediation to Treat Groundwater Impacted with Chlorinated Solvents.** *A. Haryani and R. Doshi.* Reeti Doshi (AECOM Technical Services, Inc./ USA)	**Lessons Learned from Characterizing Several Dozen Sites Impacted by Perfluorinated Compounds.** *D.S. Woodward, D. Chiang, and R. Casson.* David S. Woodward (AECOM/USA)	**Anaerobic and Aerobic Biodegradation of the Oil-Dispersant Components 1,2-Propanediol and 2-Butoxyethanol in Seawater.** *B.L. Rhiner, A.J. Kunkle, K.T. Finneran, and D.L. Freedman.* Benjamin L. Rhiner (Rogers and Callcott Environmental/USA)
8:50	**Impacts of Iron (II) Sulfide Precipitation on the Permeability of Porous Media.** *T.F. Marcet, S.P. Gaeth, K.D. Pennell, N.L. Cápiro, F.E. Loeffler, and Y. Yang.* Tyler F. Marcet (Tufts University/USA)	**Remediation of Perfluroalkyl Compounds by Oxidation Using Ferrate (IV), (V) and (VI).** *R. Darlington, B. Yates, K. Kucharzyk, V. Sharma, and R. Zboril.* Ramona Darlington (Battelle/USA)	**Biodegradation of Alkylated PAHs in Marsh and Mangrove Systems in Coastal Louisiana.** *M. Rodrigue, V. Elango, and J.H. Pardue.* John H. Pardue (Louisiana State University/ USA)
9:15	**Optimizing Bioremediation at Mixed Contaminant Sites: Lessons Learned in the Laboratory and in the Field.** *P. Dennis, S. Dworatzek, J. Roberts, P. Dollar, R. Workman, and F.B. Baddour.* Phil Dennis (SiREM/Canada)	**Degradation of Perfluorinated Compounds by Fungal Pure Cultures and Groundwater Microcosms.** *R. Deeb, S. Mahendra, and N. Tseng.* Rula Anselmo Deeb (Geosyntec Consultants, Inc./USA)	**Approaches to Monitor and Characterize Surface Water Sheens.** *J.K. Sueker, R. Parmelee, and S. Patil.* Julie Sueker (ARCADIS U.S., Inc./USA)
9:40	**BREAK**	**Potential Treatment Train Options for Persistent Per/Polyfluoroalkyl Acids.** *L.S. Lee, S. Park, and J. Zenobio.* Linda S. Lee (Purdue University/USA)	**BREAK**
10:05	**Biofilm-Covered Activated Carbon Particles Enhance Bioremediation of Polychlorinated Biphenyls (PCBs) in Sediment.** *F. Akbari, M. Horwat, S.J. Edwards, and B.V. Kjellerup.* Birthe V. Kjellerup (University of Maryland at College Park/USA)	**BREAK**	**Biodegradation of Oil by Arctic Marine Microorganisms.** *K.M. McFarlin, R.A. Perkins, and M.B. Leigh.* Kelly McFarlin (University of Alaska Fairbanks/ USA)
10:30	**Biostimulation and Bioaugmentation of 700 Injection Wells to Remediate a 20-Acre Chlorinated Solvent Plume.** *M. Perlmutter, J. Minchak, S. Appaji, and S. Jetter.* Mike Perlmutter (CH2M HILL/USA)	**Bioremediation of 1,4-Dioxane and Mixed Chlorinated Solvents Using Monooxygenase-Expressing Bacteria.** *D.F. Alden and G.M. Birk.* David F. Alden (Tersus Environmental, LLC/ USA)	**Bioremediation of Weathered Crude Oil in Complex Soils: A Southern Minnesota Field Study.** *J. Powell and K. Rapp.* Jeff Powell (Pinnacle Engineering, Inc./USA)
10:55	**Aerobic Bioaugmentation of RDX-Contaminated Groundwater.** *F.H. Crocker, K.J. Indest, C.M. Jung, D.E. Hancock, M.E. Fuller, P.B. Hatzinger, J.D. Istok, and M.M. Michalsen.* Fiona H. Crocker (U.S. Army Corps of Engineers/USA)	**Understanding and Improving Attenuation of 1,4-Dioxane: Data Mining and Treatment Trains.** *D.T. Adamson, C.J. Newell, D. Bryant, S. Mahendra, and M.S. Wong.* David T. Adamson (GSI Environmental, Inc./ USA)	**Diurnal and Seasonal Temperature Changes Affect Biodegradation of Petroleum Hydrocarbons in Sub-Arctic Soils by Altering Microbial Community.** *A. Akbari, W. Chang, and S. Ghoshal.* Ali Akbari (McGill University/Canada)
11:20	**Comparison of Enhanced Anaerobic Bioremediation (EAB) to EAB Combined with In Situ Chemical Reduction at Concord NWS.** *N. Hey, A. Estey, S. Anderson, V. Harris, D. Leigh, and E. Cooper.* Neil Hey (CB&I Federal Services LLC/USA)	**Cometabolic Biodegradation of Commingled 1,4-Dioxane and Chlorinated Solvent Plumes.** *B. Yuncu, J.L. Keener, R.C. Borden, S.D. Richardson, K.C. Glover, and A. Bodour.* Bilgen Yuncu (Solutions-IES, Inc./USA)	**Influence of Bioaugmentation on Canadian Oilsands and Tailings Processing.** *R.L. Brigmon, C. Milliken, M. Moultrie, J. Fox, and W. Simpson.* Robin Lewis Brigmon (Savannah River Nuclear Solutions/USA)

A9. Successes and Failures of Bioaugmentation and Biostimulation

B9. Emerging Contaminants: Perfluorinated Compounds

C8. Bioremediation in Marshes and Deep-Sea Environments

B10. Emerging Contaminants: 1,4–dioxane

C9. Biodegradation and Remediation of Crude Oil in Cold Regions

D Sessions Brickell	E Sessions Orchid	F Sessions Jasmine	
D7. Advances in Monitoring and Optimization Techniques **Time versus Money: A Quantitative Approach to Selection of Groundwater-Monitoring Frequency.** *T.E. McHugh, P.R. Kulkarni, and C.J. Newell.* Thomas E. McHugh (GSI Environmental, Inc./USA)	**E8. International Challenges and Applications for Site Characterization and Bioremediation** **Case Study: Negotiations with the Environmental Agency for the Use of Monitored Natural Attenuation at a Pharmaceutical Manufacturing Facility in Brazil.** *B.G. Pascale, D. Ross, S. Loebmann, M. Leahy, and C. Baroni.* Beatriz Pascale (ERM/Brazil)	**F9. Bioremediation of Deep Contamination** **In Situ Degradation of DNAPL/Sorbed Contamination in Soil and Fractured Bedrock using a Low Grade Thermal Enhancement.** *J. Paquin, P. Pasquier, and B. Demers-Giroux.* Jean Paquin (Sanexen Environmental Services, Inc./Canada)	**8:00**
Ternary Diagrams of BTEX Concentrations to Evaluate Remediation Performance: Examples from a Former Refinery Site. *D. Segal, T. Buscheck, and E. Fay.* Daniel Segal (Chevron/USA)	**A Biostimulation Program Applied at a DNAPL-Contaminated Site in an Urban Setting.** *M.M.M. Nobre, R.C.M. Nobre, P.A. Pereira, D. Ogles, and A. Biernacki.* Manoel M.M. Nobre (Maia Nobre Engenharia/Brazil)	**Understanding the Potential for Bioremediation of ^{129}I at the Hanford Site, Washington.** *J.T. Ellis, E. Eisenhauer, A. Dodwell, B. Lee, and M.H. Lee.* M. Hope Lee (Pacific Northwest National Laboratory/USA)	**8:25**
Quantifying Enhanced Anaerobic Bioremediation of Chlorinated Solvents. *M.G. Alicea and M.A. Widdowson.* Mark A. Widdowson (Virginia Tech/USA)	**High-Resolution Site Characterization (HRSC) in South Africa: Challenges, Successes and Lessons Learned.** *S.D. Mohr, S. McKeown, and R.J. Fiacco.* Steve McKeown (ERM/South Africa)	**Technical and Policy Challenges for Remediating Metals and Radionuclides in Deep Vadose Zone Environments.** *D.M. Wellman, M.J. Truex, and M.D. Freshley.* Dawn Wellman (Pacific Northwest National Laboratory/USA)	**8:50**
Big Data Analysis to Select the Best Remedial Technology to Meet Remedial Objectives. *S. Baez-Cazull, S. James, J. Moore, M. Bruckner, D. Gimon, R. Porter, P. Hayes, J. Horin, and R. Hunter Anderson.* Susan Baez-Cazull (Noblis/USA)	**Earthworms Improve Heavy Hydrocarbon Degradation in Soil.** *S.K. Davidson, L. Martinkosky, G.P. Sabadell, and H.L. Gough.* Seana K. Davidson (University of Washington/USA)	**Evolution of a Remedial Injection Program in Metamorphic Bedrock.** *S.W. Kirschner, C.E. Petko, and W.W. Slack.* Stephen W. Kirschner (Advanced GeoServices Corp./USA)	**9:15**
When and Where Are High-Resolution Data Required? Sequence Stratigraphy to Determine Depositional Environment and Data Requirements for Optimized Remediation. *M.R. Shultz, R. Cramer, D. Tisoncik, and C. Plank.* Michael R. Shultz (AECOM/USA)	**Bioremediation of Petroleum Hydrocarbon-Contaminated Soil Following Ozone Pre-treatment.** *A.G. Delgado, I. Halloum, T. Chen, B.M. Yavuz, J. Maldonado Ortiz, F.M. Alam, B.E. Rittmann, R. Krajmalnik-Brown, E.A. Edwards, and D. Kong.* Anca G. Delgado (Arizona State University/USA)	**Field-Scale Application of Biostimulation and Bioaugmentation of Chlorinated Ethenes in Groundwater.** *L. LaPat-Polasko, S. Baffert, and L. Conlan.* Laurie T. LaPat-Polasko (ENVIRON International/USA)	**9:40**
BREAK	**BREAK**	**Substrate Delivery to Treat a Deep TCE Plume in a Highly Heterogeneous Unconsolidated Aquifer.** *M.-Y.J. Chu, P. Bennett, and Z. Xiong.* Min-Ying Jacob Chu (Haley & Aldrich, Inc./USA)	**10:05**
D8. Mass Flux and Mass Discharge **Contaminant Mass Discharge Reduction Measured Using an Existing Pump-and-Treat System as a Compliance Metric for Source Treatment.** *D.J. Giaudrone, S.E. Coffey, T.W. Macbeth, N.L. Smith, R.W. Chappell, M.S. Murphy, K. Lynch, and H. Orlean.* Dominic J. Giaudrone (CDM Smith/USA)	**E9. Bioremediation in Latin America** **In Situ Remediation in Brazil.** *A. Weston, S. Dore, D. Pope, and C. Bucior.* Sophia Dore (Conestoga-Rovers and Associates/GHD/USA)	**BREAK**	**10:30**
Flux-Based Mass Balance Framework to Assess Enhanced Bioremediation Outcomes. *E.B. White, M.D. Annable, C.E. Schaefer, G. Lavorgna, and T. Ault.* Erin B. White (University of Florida/USA)	**Remedial Actions in Colombia: Challenges and Progress to Date.** *J.F. Molina, J. Henderson, L. Trento, S. Prince Cachon, and J. Mueller.* Juan F. Molina (EcoSoluciones SAS/Colombia)	**F10. Bioremediation of Sediments** **Technology for Inhibiting Methanogenesis during In Situ Sediment Treatment.** *J. Hull and J. Mueller.* Jim Mueller (Provectus Environmental Products/USA)	**10:55**
Determining Mass Flux and Natural Attenuation of a Legacy Groundwater VOC Plume Discharging into San Diego Bay. *M. Pound, W. Locke, N.D. Durant, L.V. Smith, K.S. Smith, L. Maclean, D. Roff, C. Wanyoike, B. Chadwick, P. Stang, and G. Alyanakian.* Michael J. Pound (U.S. Navy/USA)	**Comparative Pilot-Scale Evaluation and Cost Benefit Analyses of ISCR, ISCO and ERD for Treatment of CVOCs at a Site in Brazil.** *S. Aluani, C. Spilborghs, T. Xavier, E. Pujol, and F. Tomiatti.* Sidney Aluani (SGW Services Engenharia Ambiental Ltda./Brazil)	**An In Situ Pilot Study Evaluating the Efficacy of Bioaugmentation for Treatment of PCB-Impacted Sediments in Abrahams Creek, Quantico, VA.** *K.R. Sowers, R. Payne, U. Ghosh, and H.D. May.* Kevin R. Sowers (University of Maryland Baltimore County/USA)	**11:20**

THURSDAY AFTERNOON

	A Sessions Tuttle	B Sessions Monroe	C Sessions Flagler
11:45		B10. Emerging Contaminants: 1,4–dioxane **Remediation of 1,4-Dioxane Using a Thermophilic Aerobic Bacteria and Its Cell-Free Extract.** *R. Sambrotto, K. O'Driscoll, R.M. DiFilippo, P. Piccillo, S. Koenigsberg, and J. Guarnaccia.* Raymond Sambrotto (Thermocyclomics/USA)	C9. **Amorphous and Crystalline Phosphorus Interactions with Organic Acids during In Situ Hydrocarbon Degradation in Cold Soils.** *S.D. Siciliano, J.D. Peak, C. Phillips, T. Chen, A. Schebel, T. Carlson, J. Grosskleg, R. Wilson, D. Black, B. Chartrand, and C. Belair.* Steven Siciliano (University of Saskatchewan/ Canada)
12:10	**LUNCH**	**Field Application of Biomarker-Based Tools to Validate 1,4-Dioxane Biodegradation.** *D. Chiang, R. Mora, P. Gedalanga, P. Pornwongthong, and S. Mahendra.* Dora Chiang (AECOM/USA)	**Petroleum Hydrocarbon Degradation in Frozen Soils Using Bonemeal Biochar.** *E.M. Karppinen and S.D. Siciliano.* Erin Karppinen (University of Saskatchewan/ Canada)
12:35	A10. Cometabolic Bioremediation **Demonstration of Aerobic Cometabolism to Support Selection of Monitored Natural Attenuation as a Remedy.** *J. Gamlin, L. Royer, T. Chakurian, G. Anderson, and L. Duke.* Jeff Gamlin (CH2M HILL/USA)	**LUNCH**	**LUNCH**
1:00	**Engineering Principles of Implementing Aerobic Cometabolic 1,4-Dioxane Biodegradation with Groundwater Recirculation for Dilute Plume Treatment.** *M.-Y.J. Chu and P. Bennett.* Min-Ying Jacob Chu (Haley & Aldrich, Inc./USA)		
1:25	**Cometabolic Bioremediation of TCE and 1,4-Dioxane with Methane and Oxygen at Air Force Plant 44.** *J. Kim, V. Sadeghi, S. Dworatzek, G. Birk, and D. Knight.* Venus M. Sadeghi (AECOM/USA)	B11. Other Emerging Contaminants **Programmatic Approaches for Management of Emerging Contaminants.** *W.H. DiGuiseppi.* William H. DiGuiseppi (CH2M HILL/USA)	C10. Biological Processes in Unconventional Oil and Natural Gas Development **Evaluating Key Sources of Variability in Pre-Drill Sampling Results at Residential Water Wells.** *S.D. Richardson, L.J. Molofsky, A.P. Smith, and J.A. Connor.* Stephen D. Richardson (GSI Environmental Inc./USA)
1:50	**Cometabolism of Vinyl Chloride in an Aquifer Co-contaminated with Benzene.** *J.R. Woertz, J. Rehage, and C. Watts.* Jennifer R. Woertz (AECOM/USA)	**Laboratory Treatability Studies to Assess Degradation Processes for 1,2-Dichloropropane.** *M. Kozar, E. Schleicher, and B. Bakrania.* Michael Kozar (O'Brien & Gere/USA)	**Preservation of Dissolved Gas Samples Collected via Displacement Methods.** *P.W. McLoughlin and R.J. Pirkle.* Pat McLoughlin (Pace Analytical Energy Services/USA)
2:15	**Kinetics of Aerobic Cometabolism of 1,4-Dioxane by Propane-Oxidizing Bacteria.** *F. Barajas and D.L. Freedman.* Francisco Barajas (Clemson University/USA)	**A Case for the Development of a Pentachlorophenol-Degrading Consortium.** *D. Graves, A. Montgomery, E. Mott-Smith, E. Hicks, and C. Butler.* Ernest Mott-Smith (Black & Veatch/USA)	**Organically Modified Silica Hydrogels with Encapsulated Bacteria for Bioremediation of PAH from Hydraulic Fracturing Waters.** *J.K. Sakkos, D. Kieffer, L.P. Wackett, and A. Aksan.* Jonathan K. Sakkos (University of Minnesota/ USA)
2:40	**Successful Field Demonstrations of In Situ Remediation of Three Key Emerging Contaminants Using Cometabolism.** *D.R. Lippincott, P. Hatzinger, R. Steffan, C. Schaefer, S. Streger, and S. Vainberg.* David R. Lippincott (CB&I Federal Services, LLC/USA)	**Phased Sustainable Bioremediation Obtains Closure of a Perchlorate-Contaminated Site.** *K.A. Morris.* Kevin A. Morris (ERM/USA)	**Algae-Based Treatment of Hydraulic Fracturing Flowback Water: Metal Removal and Lipid Accumulation by Green Microalgae *Dunaliella salina*.** *S. Ranjbar and B. Van Aken.* Sibia Ranjbar (Temple University/USA)
3:05	**Propanotrophic Cometabolism of 1,4-Dioxane at High Concentrations.** *A.A. Ramos, P. Arve, and D.L. Freedman.* Angel Alejandro Ramos-Garcia (Clemson University/USA)		**Does Wastewater from Energy Resource Development Select for Antimicrobial-Resistant Bacteria?** *H. Delos Reyes, A. Eramo, N. Fahrenfeld, A. Mumford, D.M. Akob, and I.M. Cozzarelli.* Nicole Fahrenfeld (Rutgers University/USA)

D Sessions Brickell	E Sessions Orchid	F Sessions Jasmine	
D8. Mass Flux **High-Resolution Site Characterization in a Complex Deltaic Setting.** *R.J. Desrosiers and G.T. Brookman.* Richard J. Desrosiers (GZA GeoEnvironmental, Inc./USA)	**E9. Bioremediation in Latin America** **Evaluation of the Combined Use of MNA and Active Pump and Treat System at a Chemical Facility in Brazil.** *F. Coelho.* Flavio Coelho (ERM Brasil Ltda./Brazil)	**F10. Bioremediation of Sediments** **Exploration of Bauxaline, Granulated Bauxaline and Bauxsol for the Stabilization of Trace Metals in Marine Dredged Sediments.** *M. Taneez, C. Hurel, and N. Marmier.* Mehwish Taneez (University of Nice Sophia-Antipolis/France)	**11:45**
	Evidence of Vinyl Chloride Degradation at an Industrial Site Using Molecular Diagnostics. *R.C.M. Nobre, M.M.M. Nobre, P.A. Pereira, and D. Ogles.* Rosane C.M. Nobre (Federal University of Alagoas/Brazil)	**RECOY—Green Soil Washing Technology.** *F.L. Pecoraro and L.H.A. Diniz.* Fernando Pecoraro (AMBIEVO S.A./Brazil)	**12:10**
LUNCH			**12:35**
	LUNCH	**LUNCH**	**1:00**
D9. High-Resolution Site Characterization **High-Resolution Site Characterization: The State of the Practice.** *S. Pitkin.* Seth Pitkin (Stone Environmental, Inc./USA)			
High-Resolution Characterization of DNAPL Source Zone Architecture in Clay Till. *M.M. Broholm, A.S. Fjordbøge, G.S. Janniche, T. Jørgensen, J. Damgaard, K. Martinez, B. Grosen, G. Wealthall, A.G. Christensen, and H. Kerrn-Jespersen.* Mette M. Broholm (Technical University of Denmark/Denmark)	**E10. Case Studies and Lessons Learned Applying Bioremediation Internationally** **Remediation for Mercury Stabilization by In Situ Chemical Reduction (ISCR) in Groundwater (Brazil Site).** *S. Aluani, C. Spilborghs, N. Nascimento, E. Pujol, and F. Tomiatti.* Sidney Aluani (SGW Services Engenharia Ambiental Ltda./Brazil)	**F11. Climate Considerations Associated with Bioremediation** **Assessment of Secondary Organic Aerosol Formation by Bioremediation of a Polycyclic Aromatic Hydrocarbon-Contaminated Site.** *Z. Zhang and F. Wang.* Zhenyi Zhang (Tsinghua University/China)	**1:25**
Improving Mass Flux Estimates through Hydrofacies Analysis. *P.J. Curry, J.A. Quinnan, and N.R.H. Welty.* Patrick J. Curry (ARCADIS U.S., Inc./USA)	**In Situ Bioremediation to Protect a Residential Area.** *A. Pessoa, R. Spina, A. Yoshinari, and G.V. Daele.* Afranio Pessoa Cavalcante (Geoklock Environmental Consultancy/Brazil)	**The Influence of Climatic Uncertainty on Bioremedial Methods Intended to Protect and Restore Sensitive and Critical Water Resources.** *S.D. Warner.* Laurie T. LaPat-Polasko (ENVIRON International/USA)	**1:50**
Field Testing of High-Resolution Chlorinated DNAPL Logging System. *R. St. Germain, M. Einarson, A. Fure, and S. Chapman.* Randy St. Germain (Dakota Technologies, Inc./USA)	**Full-Scale Demonstration of Enhanced In Situ Bioremediation (EISB) with a Focus on Chloroform at a Field Site in Brazil.** *R.F. Lagoa, J.K. Henderson, L.M. Trento, I. Camargo, C.H. Araujo, M. McMaster, S. Justicia-Leon, and C.J. Wilson.* Renata Lagôa (CPEA/Brazil)	**Groundwater Flow and Remediation of Hydrocarbons in the Freeze/Thaw Zone of a Fractured Clay Till.** *R.D. Wilson, D. Black, S.D. Siciliano, T. Carlson, J. Grosskleg, and B. Chartrand.* Ryan Wilson (Amec Foster Wheeler/Canada)	**2:15**
Magnetic Susceptibility as a Tool for Assessing Bioremediation of Hydrocarbon-Contaminated Sites. *E.A Atekwana, L.D. Slater, D. Ntarlagiannis, C.L. Beaver, A. Williams, and S. Rossbach.* Dimitrios Ntarlagiannis (Rutgers University - Newark/USA)		**Management Strategies to Achieve Remedy Complete when Groundwater Concentrations Fluctuate with Water Table Changes and Drought Conditions.** *M.L. Alexander and J.Y. Jin.* Matthew L. Alexander (Leidos/USA)	**2:40**
Use of High-Resolution Site Characterization Tools to Efficiently Find and Delineate the Leading Edges of Multiple Groundwater Contaminant Plumes. *J. Eberharter, K. Simon, E. Gaiser, and R. Hobbs.* Joachim Eberharter (Tetra Tech, Inc./USA)			**3:05**

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Tuesday Platform Sessions

A1. Aerobic and Anaerobic Biodegradation of Organic and Inorganic Contaminants
Ben Mork (Regenesis)
Kent Sorenson (CDM Smith)

A2. Advances in Biological Oxidation of Chloroethenes and Other Priority Contaminants
Alison M. Cupples (Michigan State University)
Timothy E. Mattes (University of Iowa)

A3. Phytoremediation
Tesema Chekol (Battelle)
David Tsao (BP Products North America, Inc.)

A4. Mycoremediation
Claudia Gunsch (Duke University)

B1. Chlorinated Compound Vapor Intrusion
Damon DeYoung (Battelle)
Loren Lund (CH2M HILL)

B2. Petroleum Hydrocarbon Vapor Intrusion
John E. Boyer (NJ Dept of Environmental Protection)
Paul Michalski (Trihydro Corporation)

B3. Innovative Tools for Evaluating Vapor Intrusion Risk
Thomas E. McHugh (GSI Environmental, Inc.)
Ryan M. Wensink (Battelle)

B4. Vapor Intrusion Mitigation Methods
David J. Folkes (Geosyntec Consultants, Inc.)
Kelly Ameli Smith (Land Science Technologies)

C1. Remediation of Hydrocarbon Spills
Curtis C. Stanley (Shell Global Solutions)

C2. Advances in Free-Product Recovery
Harley H. Hopkins (ExxonMobil Environmental Services Co.)
Jim Langenbach (Geosyntec Consultants)

C3. Advances in Oxygenate Remediation
Pamela L. Chang (Battelle)

D1. Tools for Assessing MNA
Christoper R. Murray (U.S. Navy)
John T. Wilson (Scissortail Environmental Solutions, LLC.)

D2. Natural Attenuation Processes
Yunzhou (Joe) Chai (The Dow Chemical Company)
Patricia Venable (U.S. Navy)

D3. MNA for Achieving Site Goals
James M. Tarr (U.S. Navy)
Ryan A. Wymore (Geosyntec)

E1. Optimizing Existing Systems
Keith Aragona (Haley & Aldrich, Inc.)
Richard B. Wice (Tetra Tech, Inc.)

E2. Risk Management Strategies
Paul J. Favara (CH2M HILL)
Dave Wandor (TEA Inc.)

E3. Licensed Site Remediation Professional Programs: Successes and Challenges
Nick DeRose (Langan Engineering and Environmental Services)
Steve Posten (Amec Foster Wheeler)

F1. Strategies for Bioremediation Performance Assessment
Dan Bryant (Geo-Cleanse International, Inc.)
Arne Olsen (U.S. Navy)

F2. Biobarrier Installation and Management
Cannon F. Silver (CDM Smith)

F3. Amendment Delivery Strategies
David L. Freedman (Clemson University)
Stephen H. Rosansky (Battelle)

F4. Advances in Amendment Formulation
William A. Newman (RNAS Remediation Products)

Wednesday Platform Sessions

A5. Engineering Biogeochemical Transformation
Adria Bodour (U.S. Air Force)
Patrick J. Evans (CDM Smith)

A6. Microbial Fuel Cells
Zhiyong (Jason) Ren (University of Colorado Denver)
Yi (Eve) Zuo (Chevron Energy Technology Company)

A7. Combined Remedies for VOCs
Bella Bakrania (O'Brien & Gere)

A8. Combined Remedies for Other Contaminants
Jeremy Birnstingl (Regenesis)

B5. Munitions Response Site Management Strategies
Les Clarke (Battelle)

B6. Bioremediation of Munitions Constituents
Paul B. Hatzinger (CB&I Federal Services)
Andrea Leeson (SERDP/ESTCP)

B7. Emerging Contaminants: Chromium
Lucas A. Hellerich (AECOM)
Kevin M. Sullivan (PG&E)

B8. Emerging Contaminants: Other Metals
Jeff Gillow (ARCADIS U.S., Inc.)

C4. Petroleum Hydrocarbon-Related Molecular Diagnostics
Kate Kucharzyk (Battelle)
Frank E. Loeffler (University of Tennessee Knoxville)

C5. Chemical Fingerprinting and Forensics
Jun Lu (AECOM)

C6. Aerobic Processes for the Remediation of Petroleum Hydrocarbon Sites
Drew Baird (Regenesis)
Jack Sheldon (Antea Group)

C7. Remediation of Heavy Hydrocarbon-Contaminated Soils
Thomas P. Hoelen (Chevron)

D4. Fate and Transport of Biofuels
William G. Rixey (University of Houston)

D5. Compound-Specific Isotope Analysis
Ramon Aravena (University of Waterloo)
Timothy E. Buscheck (Chevron Energy Technology Company)

D6. Molecular Biological Tools
Dora Ogles (Microbial Insights, Inc.)

E4. Best Practices in GSR
Melissa A. Harclerode (CDM Smith)
L. Maile Smith (Northgate Environmental Management, Inc.)

E5. Incorporating GSR into Remedy
Stephanie Fiorenza (BP)
Michael E. Miller (CDM Smith)

E6. Sustainable Remediation Assessment Tools
Carol Lee Dona (U.S. Army Corps of Engineers)
Kristin Mancini (ARCADIS U.S. Inc.)

E7. International Perspective on GSR
Barbara Maco (Wactor & Wick LLP)
Amanda McNally (AECOM)

F5. Ex Situ Biological Treatment
Russell R. Sirabian (Battelle)

F6. Biodegradation in Fractured Bedrock Sites
Rula Anselmo Deeb (Geosyntec Consultants, Inc.)
Craig A. Sandefur (Regenesis)

F7. Biodegradation in Complex Geological Sites
Michael J. Pound (U.S. Navy)
William Slack (FRx, Inc)

F8. Managing Large and Dilute Plumes
Mary F. DeFlaun (Geosyntec Consultants, Inc.)
Tamzen Macbeth (CDM Smith)

Thursday Platform Sessions

A9. Successes and Failures of Bioaugmentation and Biostimulation
Rick D. Gillespie (Regenesis)
Mandy M. Michalsen (USACE)

A10. Cometabolic Bioremediation
Clifford Lange (Auburn University)
Venus M. Sadeghi (AECOM)

B9. Emerging Contaminants: Perfluorinated Compounds
Ronald C. Porter (Noblis, Inc.)

B10. Emerging Contaminants: 1,4–dioxane
Sandip Chattopadhyay (Tetra Tech, Inc.)
Rebecca H. Mora (AECOM)

B11. Other Emerging Contaminants
William H. DiGuiseppi (CH2M HILL)
Michael A. Singletary (U.S. Navy)

C8. Bioremediation in Marshes and Deep-Sea Environments
John S. Brown (Exponent)
John H. Pardue (Louisiana State University)

C9. Biodegradation and Remediation of Crude Oil in Cold Regions
Barry J. Harding (AECOM Technical Services, Inc.)
Roger C. Prince (ExxonMobil Research and Engineering Co.)

C10. Biological Processes in Unconventional Oil and Natural Gas Development
Andrew C. Barton (Battelle)
Bert Fisher (Lithochimeia, Inc.)

D7. Advances in Monitoring and Optimization Techniques
Joshua Van Bogaert (U.S. Army Corps of Engineers)
Todd H. Wiedemeier (T.H. Wiedemeier & Associates, Inc.)

D8. Mass Flux and Mass Discharge
Michael Kozar (O'Brien & Gere)

D9. High-Resolution Site Characterization
Seth Pitkin (Stone Environmental, Inc.)
Heather V. Rectanus (Battelle)

E8. International Challenges and Applications for Site Characterization and Bioremediation
Jean M. Bodeau (Chevron)
Robert E. Hinchee (Integrated Science & Technology, Inc.)

E9. Bioremediation in Latin America
Paula A. Barreto Quintero (Clemson University)
Shandra D. Justicia-Leon (ARCADIS U.S.)

E10. Case Studies and Lessons Learned Applying Bioremediation Internationally
Ricardo Aguerre (Promotora Ambiental, S.A.B. de C.V.)
Carlos Eduardo Cano (Basa)

F9. Bioremediation of Deep Contamination
M. Hope Lee (Pacific Northwest National Laboratory)
Paula Chang Panzino (Haley & Aldrich, Inc.)

F10. Bioremediation of Sediments
Ramona Darlington (Battelle)

F11. Climate Considerations Associated with Bioremediation
Jake Torrens (Amec Foster Wheeler)
John Vidumsky (DuPont Corporate Remediation Group)

Panel Discussions

Tuesday—Track C
TPH—What is the Right Cleanup Level?
Moderator: Sarah McMillen (BP)

Tuesday—Track E
Do GSR Frameworks Represent Ecosystem Services and Natural Resources?
Moderator: Rick Wice (Tetra Tech)

Wednesday—Track D
Sampling Groundwater Monitoring Wells: Is What's in the Pipe Representative of the Formation?
Moderator: Rick Cramer (AECOM)

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AECOM is a world leader in developing innovative environmental solutions with cutting-edge expertise in remediation of chlorinated and recalcitrant compounds. We have a history of solving complex site challenges around the globe using an effective endpoint strategy, while addressing a broad range of contaminants and working with diverse stakeholders. Bringing together the best resources in the marketplace, AECOM remediation teams critically assess the nature and extent of contamination; risks to receptors and safe exposure levels; utilize leading-edge biological, chemical and physical technologies to reduce project costs; and prepare remedial designs that appropriately address the problems posed by the contaminants. We provide comprehensive consulting, engineering, remediation, compliance, permitting and environmental management solutions for multinational clients in the private and public sectors. AECOM is a global design and management firm with 45,000 employees in 150 countries serving the environmental, transportation, facilities, oil and gas, mining, energy, water and government markets. **www.aecom.com**

The **American Petroleum Institute (API)** is the only national trade association that represents all aspects of America's oil and natural gas industry. Its more than 600 members, from the largest major oil company to the smallest of independents, come from all segments of the industry. They are producers, refiners, suppliers, pipeline operators and marine transporters, as well as service and supply companies that support all segments of the industry. The API Soil and Groundwater Technical Group has sponsored more than two hundred projects over the last 30 years, and its work is frequently presented at Battelle conferences and in peer-reviewed journals. It has been a leading contributor on such key topics as monitored natural attenuation, risk-based corrective action, soil vapor transport and residual NAPL management. **www.api.org/groundwater**

CDM Smith provides integrated solutions in water, environment, transportation, energy and facilities to public and private clients worldwide. As a full-service consulting, engineering, construction and operations firm, we deliver exceptional client service, quality results and enduring value across the entire project life cycle. Comprised of more than 5,000 employees, the firm's unwavering focus remains on creating innovative and lasting solutions that improve environmental value, quality of life and economic prosperity. With more than $1.2 billion in annual revenues, we maintain the size, stability and resources to successfully undertake a diverse range of projects, applying local knowledge through a network of more than 125 offices worldwide while leveraging the full resources and expertise of our global staff. **www.cdmsmith.com**

FRx is recognized by leading environmental professionals as the premier service provider for injecting treatment materials at contaminated sites. FRx has spent twenty years inventing, demonstrating, improving, and commercializing a suite of technologies that have proven crucial to the remediation of any and all contaminants in all earth materials: hydraulic fracturing through direct push (soil); jet-assisted fracturing through direct push (soil); jet fracturing through cased hole (soil and weathered rock); jet-assisted fracturing through cased hole (soil, weathered rock, and fractured rock); and hydraulic fracturing in open rock (weathered rock, fractured rock, and unfractured rock). If your project seems impossible by any other means, FRx has a solution for putting treatment materials in contact with contaminants. A game-changing solution including costs starts with a 15-minute conversation. Please contact us any time at 864.356.8424 to find out how we can make your goals possible. **www.frx-inc.com**

O'Brien & Gere has become more than an engineering solutions company throughout our history of creating a better future since 1945. At the center of our story are clients ranging from advanced manufacturers to higher education, federal agencies, and municipalities. These clients trust us to deliver sustainable solutions and integrate innovative technology to solve the evolving advanced manufacturing, energy, environmental, and water challenges of today and tomorrow. O'Brien & Gere provides cost-effective remediation solutions to reduce client environmental liabilities and satisfy the objectives of project stakeholders. Offering single-source responsibility, O'Brien & Gere personnel have capabilities to support a wide range of remedial programs, from site investigations and remedial alternative evaluations to remedial design and construction, commissioning, operation and maintenance, and closure. O'Brien & Gere has extensive experience remediating former industrial waste sites. **www.obg.com**

REGENESIS is the global leader in the research, development and commercialization of technology-based solutions for the environment. More specifically, the Company specializes in scientifically proven product and services-based solutions for groundwater and soil remediation. This unique combination of innovative products and expert-based services results in a high-degree of certainty when it comes to meeting contaminated site remediation objectives. Specific to the area of vapor intrusion mitigation, Land Science Technologies, a division of REGENESIS, provides a range of proven technologies and systems to address this growing environmental concern. REGENESIS is a worldwide organization, drawing from over 20 years of environmental remediation experience on over 20,000 projects in over 26 countries. With offices throughout the United States and Europe, as well as distribution partners strategically placed throughout the globe, our solutions have been successfully used by environmental consulting, engineering and construction firms to serve a broad range of clients. These include Fortune 500 companies, private real estate owners, insurance companies, private manufacturers, municipalities, regulatory agencies, and federal, state and local governments. **www.regenesis.com; www.landsciencetech.com.**

The Sustainable Remediation Forum (SURF) is a nonprofit organization of members from the environmental remediation stakeholder community, including consultants, responsible parties, and regulators. SURF promotes the use of sustainable practices during the life cycle of remediation projects including planning, investigation, construction, operation, site redevelopment, and monitoring, with the objective of balancing economic viability, conservation of natural resources and biodiversity, and the enhancement of the quality of life in surrounding communities. The mission of SURF is to maximize the overall environmental, societal, and economic benefits from the site cleanup process by advancing the science and application of sustainable remediation; developing best practices; exchanging professional knowledge; and providing education and outreach. SURF also includes several university student chapters. Since its founding in 2006, SURF has brought together the best and the brightest in the remediation field and has led the evolution of sustainable remediation from conceptual discussions to standard operating procedure. **www.sustainableremediation.org**

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2016 CHLORINATED CONFERENCE

Tenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds

May 23–26, 2016 | Palm Springs, California

The *International Conference on Remediation of Chlorinated and Recalcitrant Compounds* is the world's largest and most comprehensive meeting on the application of innovative and existing technologies and approaches for characterization, monitoring and management of chlorinated and complex sites. The 2014 Conference was attended by 1,650 environmental professionals from 28 countries.

The 2016 Chlorinated Conference will be organized around the following themes:

- *Management and Restoration of Complex Sites*
- *Refining the Conceptual Site Model–When Is It Enough?*
- *Advanced Diagnostic Tools and Strategies*
- *Emerging and Persistent Issues*
- *Vapor Intrusion*
- *Metals*
- *Munitions Response and Site Management*
- *Adopting and Applying Risk-Based Approaches*
- *Combining Remedies to Achieve Remedial Action Objectives*
- *Lessons Learned from Source Zone Remediation*
- *Remediation of Bedrock and Fractured Media*
- *Remediation Technology Innovations*
- *Advances in In Situ Amendment Formulations*
- *Amendment Delivery–Lessons Learned and Innovative Approaches*
- *Management Strategies–Successes and Lessons Learned*
- *Technology Development, Transfer, and Regulatory Acceptance*

The Call for Abstracts will be available in June 2015 at **www.battelle.org/chlorcon**. Abstracts will be due September 15, 2015.

Sponsorship information:
301-670-4990 | chlorinated2016@scgcorp.com

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2017 SEDIMENTS CONFERENCE

Ninth International Conference on Remediation and Management of Contaminated Sediments

Winter 2017

The *International Conference on Remediation and Management of Contaminated Sediments* is a forum for sharing research results, practical experiences, and opportunities associated with remediating, restoring and maintaining the environmental and economic vitality of waterways. Maintaining the viability of these aquatic systems requires complex actions that affect a diverse group of stakeholders and touch a wide range of environmental, economic, political and social issues.

The Eighth Sediments Conference, held in New Orleans in January 2015, was attended by 1,100 sediments remediation and management professionals from 20 countries. The technical program encompassed 430 platform and poster presentations and four panel discussions.

The 2017 Sediments Conference will address the accumulation of potentially hazardous or toxic chemicals in the sediments of rivers, lakes, bays, harbors and oceans. The program will reflect the growing knowledge that better management of contaminated sediment systems is the key to success. Sessions will be organized according to the following general themes:

- *Remediation and Restoration Alternatives*
- *Management Approaches and Policy*
- *Remedy and Restoration Implementation*
- *Characterization, Assessment and Monitoring*
- *Environmental Processes and Modeling*

Dates and location will be announced in September 2015. The Call for Abstracts will be available in March 2016 at **www.battelle.org/sedimentscon**.

Preliminary information:
614-424-7866 | sedimentscon@battelle.org

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TUESDAY, MAY 19, 2015

7:00 a.m.-7:00 p.m. Registration, Exhibits, Poster Group 1 Display
7:00-8:00 a.m. Continental Breakfast
Lunch scheduled within each track

8:00 a.m.-5:35 p.m. Platform Sessions

A1. Aerobic and Anaerobic Biodegradation of Organic and Inorganic Contaminants
A2. Advances in Biological Oxidation of Chloroethenes and Other Priority Contaminants
A3. Phytoremediation
A4. Mycoremediation

B1. Chlorinated Compound Vapor Intrusion
B2. Petroleum Hydrocarbon Vapor Intrusion
B3. Innovative Tools for Evaluating Vapor Intrusion Risk
B4. Vapor Intrusion Mitigation Methods

PANEL. TPH—What is the Right Cleanup Level?
C1. Remediation of Hydrocarbon Spills
C2. Advances in Free-Product Recovery
C3. Advances in Oxygenate Remediation

D1. Tools for Assessing MNA
D2. Natural Attenuation Processes
D3. MNA for Achieving Site Goals

E1. Optimizing Existing Systems
E2. Risk Management Strategies
E3. Licensed Site Remediation Professional Programs: Successes and Challenges
PANEL. Do GSR Frameworks Adequately Represent Ecosytem Services and Natural Resources?

F1. Strategies for Bioremediation Performance Assessment
F2. Biobarrier Installation and Management
F3. Amendment Delivery Strategies
F4. Advances in Amendment Formulation

5:45-7:00 p.m. Poster Group 1 Presentations and Light Reception
See page 15 for sessions in Poster Group 1.

7:00-8:30 p.m. Student Mixer

WEDNESDAY, MAY 20, 2015

7:00 a.m.-7:00 p.m. Registration, Exhibits, Poster Group 2 Display
7:00-8:00 a.m. Continental Breakfast
Lunch scheduled within each track

8:00 a.m.-5:35 p.m. Platform Sessions

A5. Engineering Biogeochemical Transformation
A6. Microbial Fuel Cells
A7. Combined Remedies for VOCs
A8. Combined Remedies for Other Contaminants

B5. Munitions Response Site Management Strategies
B6. Bioremediation of Munitions Constituents
B7. Emerging Contaminants: Chromium
B8. Emerging Contaminants: Other Metals

C4. Petroleum Hydrocarbon-Related Molecular Diagnostics
C5. Chemical Fingerprinting and Forensics
C6. Aerobic Processes for the Remediation of Petroleum Hydrocarbon Sites
C7. Remediation of Heavy Hydrocarbon-Contaminated Soils

PANEL. Sampling Groundwater Monitoring Wells: Is What's in the Pipe Representative of the Formation?
D4. Fate and Transport of Biofuels
D5. Compound-Specific Isotope Analysis
D6. Molecular Biological Tools

E4. Best Practices in GSR
E5. Incorporating GSR into Remedy
E6. Sustainable Remediation Assessment Tools
E7. International Perspective on GSR

F5. Ex Situ Biological Treatment
F6. Biodegradation in Fractured Bedrock Sites
F7. Biodegradation in Complex Geological Sites
F8. Managing Large and Dilute Plumes

5:45-7:00 p.m. Poster Group 2 Presentations and Light Reception
See page 25 for sessions in Poster Group 2.

THURSDAY, MAY 21, 2015

7:00 a.m.-1:00 p.m. Registration, Exhibits, Poster Group 2 Display
7:00-8:00 a.m. Continental Breakfast
Lunch scheduled within each track

8:00 a.m.-3:30 p.m. Platform Sessions

A9. Successes and Failures of Bioaugmentation and Biostimulation
A10. Cometabolic Bioremediation

B9. Emerging Contaminants: Perfluorinated Compounds
B10. Emerging Contaminants: 1,4–dioxane
B11. Other Emerging Contaminants

C8. Bioremediation in Marshes and Deep-Sea Environments
C9. Biodegradation and Remediation of Crude Oil in Cold Regions
C10. Biological Processes in Unconventional Oil and Natural Gas Development

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D7. Advances in Monitoring and Optimization Techniques
D8. Mass Flux and Mass Discharge
D9. High-Resolution Site Characterization

E8. International Challenges and Applications for Site Characterization and Bioremediation
E9. Bioremediation in Latin America
E10. Case Studies and Lessons Learned Applying Bioremediation Internationally

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F9. Bioremediation of Deep Contamination
F10. Bioremediation of Sediments
F11. Climate Considerations Associated with Bioremediation

3:30 p.m. Symposium adjourns